August, 1956

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PIPE LINE INDUSTRY

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CONSTRUCTION • OPERATIONS • MAINTENANCE

THE LIBRARY OF CONGRESS SERIAL RECORD
SEP 7 - 1956
Copy

PACIFIC NORTHWEST LINE

Contractors cross Rockies in record time. New 2500-mile pipe line system brings natural gas to Pacific Northwest.
Page 24

SOLIDS BY PIPE LINE

Cross-country pipelining of solid materials coming soon.
Page 40

MIDGET BOOSTER STATIONS

Unattended Wyoming units increase trunkline capacity.
Page 46

Turn the page for additional contents and Quick Review of this issue

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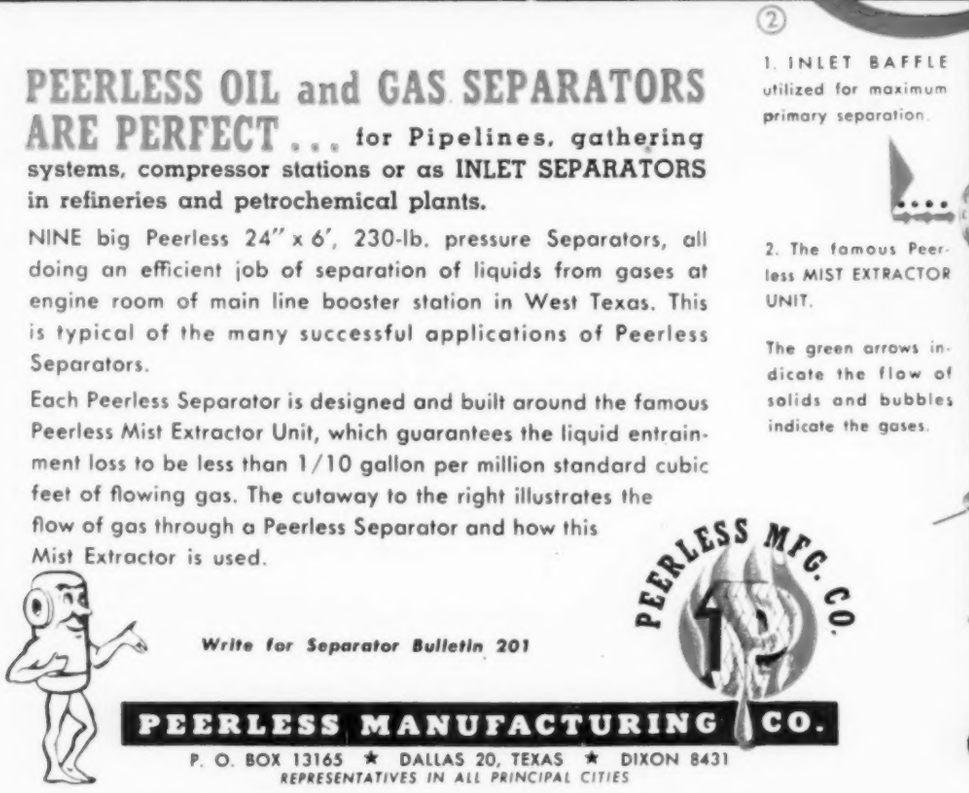
PEERLESS SEPARATORS

ALL 9 OF 'EM!

PEERLESS OIL and GAS SEPARATORS ARE PERFECT . . . for Pipelines, gathering systems, compressor stations or as INLET SEPARATORS in refineries and petrochemical plants.

NINE big Peerless 24" x 6', 230-lb. pressure Separators, all doing an efficient job of separation of liquids from gases at engine room of main line booster station in West Texas. This is typical of the many successful applications of Peerless Separators.

Each Peerless Separator is designed and built around the famous Peerless Mist Extractor Unit, which guarantees the liquid entrainment loss to be less than 1/10 gallon per million standard cubic feet of flowing gas. The cutaway to the right illustrates the flow of gas through a Peerless Separator and how this Mist Extractor is used.



1. INLET BAFFLE utilized for maximum primary separation.

2. The famous Peerless MIST EXTRACTOR UNIT.

The green arrows indicate the flow of solids and bubbles indicate the gases.

Write for Separator Bulletin 201

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PIPE LINE INDUSTRY

CONTENTS and Quick Review

August, 1956 Vol. 5, No. 2

To help put first things first, scan these time-saving digests, checking those you want to read first.

Pacific Northwest Pipe Line

☐ Contractors hurdled almost every kind of natural obstacle to lay the Pacific Northwest Pipeline Corporation system over the Rockies in record time. Compressor stations feature high altitude and cold weather design innovations.

Melvin A. Judah ..... Page 24

TGT Training Program Pays Off

☐ Fast-growing pipe line companies are faced with the problem of maintaining adequate staffs of trained operating personnel who fully understand equipment and machines they operate, the over-all operations of the company, and the full story of gas pipelining. Here is a detailed report on the mechanics of the first all-company training program in the gas transmission industry.

Don E. Lambert ..... Page 34

New Feature for Busy Pipeliners

Countless requests from PIPE LINE INDUSTRY readers have prompted us to start a new feature—**Pipe Line Panorama**—beginning on **Page 23.** Its purpose is to give a complete, rapid-fire picture of pipe line happenings and trends—tailor-made to meet the pipeliners' needs.

Setting a Pattern for Future Stations

☐ Gulf Interstate Gas Company is pleased with early performance of its "satellite" compressor station at Stanton, Ky. Its efficiency, economy, and dependability set the pattern for design of future stations..... Page 37

Long Pipe Lines for Solids Nearing Reality

☐ Once a long-range possibility in pipelining, transportation of solid materials by cross country pipe line pump station systems soon will be an operating reality. Two such lines are scheduled for operation early next year. Pittsburgh Consolidation Coal Company's 10-inch line from eastern Ohio mines to Cleveland is nearing completion. American Gilsonite Company's 6-inch line in Utah and Colorado starts construction.

Richard J. Titus ..... Page 40

Plastic Tape Tests Show Low Current Needs

☐ Cathodic protection surveys on a 12-mile section for Seadrift Pipe Line Corporation on the Texas Gulf Coast reveal that the company's 8-inch line required only 74 milliamperes for protection after two years' service. Early tests compare favorably with tests on an adjacent 18-mile section conventionally coated.

Marshall E. Parker ..... Page 44

Midget Booster Stations Doing Big Job for Service Pipe Line Company

☐ The first months of remotely controlled-unattended operation have worked out the minor faults. A 1250-horsepower electric motor-centrifugal unit at each of four stations boosts pressure on 3000 barrels of crude per hour to meet demands of Service's Ft. Laramie, Wyoming-Freeman, Missouri, line. Experience shows that the boosters are both economical and practical. They also have a high salvage value as they may be relocated quickly.

Lowell E. Anderson ..... Page 46

One Good Way to Cross a River—Move It

☐ El Paso Natural Gas Company's construction spreads used a novel method to lay an 800-foot span across the San Juan river in northern New Mexico.

Frank J. Mangan ..... Page 50

Shell Frogmen Speed Shift of Storage Tanks

☐ Frogmen were valuable additions to Shell's crew at Cheshire, England, when five storage tanks were floated to new locations on the tank farm. The swimmers kept towlines from snagging and guided the tanks onto the new foundations..... Page 53

Engineers in Management—Today and Tomorrow

☐ The fast-growing trend to transform engineers into executives has created two big problems for industry: How to determine—and develop—executive qualities in young engineers. Here is an expert's candid report on ways in which these problems can be solved.

David F. Tver ..... Page 54

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Why Another PR Editorial? Don't shrug this off with a "Heavens to Betsy, *another* discussion about oil's public relations?" Yes, it's another—another effort to try to awaken the key men of our industry to the grave danger that lies ahead for all of us *unless* a definite and constructive public relations program is enthusiastically sponsored in each of the nation's 17,000-plus oil companies.

And it won't be enough just to start a program—*it must be continued 365 days every year!*

If top management leaves it to O.I.I.C. or *anyone* else, they will discover one of these days that by that very decision they surrendered control of the oil industry as we know it today.

Public Relations Begins at the Top

The clamor about adverse public feeling toward the oil industry is rising to proportions that rival the bleak days of 1945-46.

Some will recall (though too many have forgotten) that oil leaders today are expressing serious concern over exactly the same problem—the attitude of the public—that resulted in the creation of the Oil Industry Information Committee ten years ago.

Two logical questions arise from this irksome repetition of history:

- *What new efforts will result from the 1955-56 crisis?*
- *Will another setback come ten years hence—or sooner?*

The answer to the last question depends entirely upon the direction in which the new efforts are slanted. And, as the present situation proves, the industry cannot stop history from repeating itself by depending on the company public relations personnel, associations, O.I.I.C., or others to shoulder the burden alone. A new approach must be taken.

That new approach might well center around the top management of our nation's 17,000-plus oil companies—*for it is with these key men that good public relations must begin.*

It is top management that sets public relations policy—sets the example for the actions and attitudes of employes—provides for a good or bad public relations staff—and determines the kind of "citizen" a company will be.

Far from trying to advocate that the public relations viewpoint be the dominant factor in determining company policy, it is suggested only that it be presented and considered on each occasion when there is a policy type of decision to be made.

If public relations could have only that equality in most companies with legal, sales, finance, production and research, our oil industry would be in a much better position than it is today.

In every case public good will results because the *actions* and *attitude* of top management have permeated down through every personnel level in the company—even to the most remote employe.

The oil industry potential is 2 million employes who know—or must be made to know—what public relations is and what it can do for their job and their industry. *But,* those 2 million potential public relations representatives have—and will—wait for top management to take the lead.

Any company—large or small—can play a vital role in building good will for itself and the industry if it will spend *effort* and *money* to show that:

1. It is open, friendly and communicative.
2. It considers the public interest in framing its policies and arriving at its decisions.
3. It contributes importantly to the strength and well-being of the nation.
4. It is a good employer.
5. It is alive to and readily assumes its responsibilities as a citizen.
6. It makes petroleum products better, more abundant, cheaper and more versatile through efficiency and research.
7. Its business policies are sound, its earnings reasonable.
8. It is a part of a highly competitive industry.

These goals can be reached only in proportion to the amount of support given them by top management. Once they are reached, then *and only then* will the company be able to *tell* a favorable story to the public.

There is one significant way to keep history from repeating itself: Keep in mind at all times that good public relations is created—and in too many instances destroyed—by the attitude and the lack of constructive planning on the part of top management.

IT'S LIGHTER BUT TOUGH!

41% LIGHTER!

Quick, easy operating
Slips over pipe
No hinges or latches
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Reduces fatigue

THE NEW Mathey TWIN!

PIPE CUTTING AND BEVELING MACHINE

Made of aluminum, treated with special hardening process. Approximately 41% lighter providing fatigue free durable performance. Designated as Series L, it's available in #3-L, #4-L and #5-L. The regular rugged Standard available in #1, #2, #3, #4 and #5. There is no Pipe Cutting and Beveling Machine lighter than a Mathey Twin. There is no machine more rugged than its brother, the regular Standard Model. You can't beat a Mathey Pipe Cutting and Beveling Machine for accuracy, speed and economy.

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for SPEED, ACCURACY, DEPENDABILITY, SERVICE AND ECONOMY—IT'S MATHEY

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For more data on advertised products, use Readers' Service Cards, last page.

Toughest pipeline
whipped
International

Mud-matching traction, resulting from correct power-weight balance, enables the Superior Pipe-Boom-equipped TD-18 to string pipe through boggy swales without delay. New non-slip jaw-type drum clutches provide positive boom-load control.

An International TD-18 equipped with Superior Pipe-Boom is lowering-in a section of welded 26-inch line for final tie-in. Equipment at work near Chehalis, Washington, on section 16 spread of Midwestern Constructors, Tulsa, Okla.

Contractors on the job between Chehalis, Washington and Umatilla, Oregon:

Midwestern Constructors, Inc., Tulsa, Oklahoma

River Construction Co., Fort Worth, Texas

Engineers Limited Pipeline Co., White Salmon, Washington

...in U.S.A.

...ed with

...al Crawlers

Veteran pipeliners on the New Mexico-Canada gasser sections between Chehalis, Washington, and Umatilla, Oregon agree: It's the roughest and toughest, ever! And they'd laid pipe in swamps and sandhills—through woods and over mountains!

Here, they had to bee-line through big timber up 55% mountain grades—cross a 16 mph river—overcome run-off mud from a record snow-pack.

They required big TD-24 "muscle" and exclusive Planet Power steering—with full *live power* on both tracks—for positive control under hazardous conditions. They demanded TD-18 safety and extra capacity—with quick pick-up, full-power traction, and handling ease not available elsewhere! That's why one spread used 19 big International crawlers.

See your International Construction Equipment Distributor and prove this *tough job* power!

"Elevator" power for welding crews—one of these two Carco Winch-equipped TD-18's holds or lowers the welding "wagons"—the other helps the boom tractor on the 55% grades, to position pipe for welding.

Bending and handling pipe, to and from this bender is all International powered—a U-9 power unit on the Crutcher, Rolfe & Cummings bender—a TD-18, equipped with 70,000 lb. capacity Superior Pipe-Boom speeding the job!

TD-24's—the big crawlers preferred by mountain loggers, as well as pipe-liners, worked all over the spread—clearing land, logging heavily-timbered right-of-way—winching heavy equipment upgrade—dozing "walk-ways" for backhoes. Ease of control made the giant TD-24 the choice of operators and crewmen in danger spots!

Up 55% grades, trench-digging backhoes went to work—with the aid of Carco Winch-equipped TD-24's. Tractor anchors machine to "buck" out boulders—winches it upgrade as work progresses! One of many sideline jobs for the "winch-up" tractors is yanking boulders from the right-of-way.

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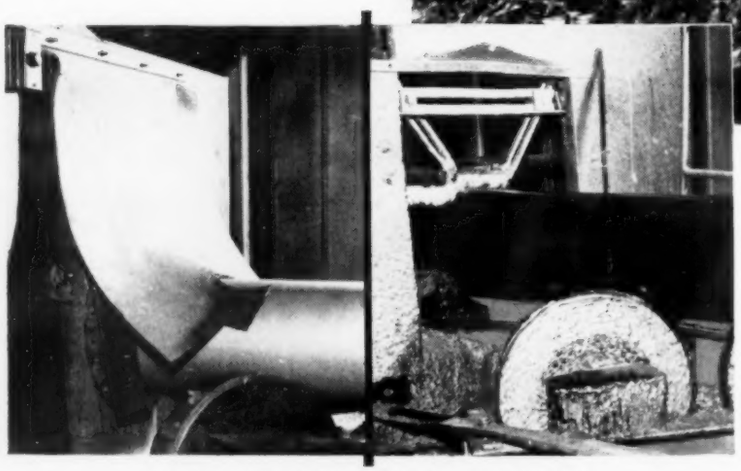
YOU CAN JEEP ENAMEL BUT NOT ITS BOND



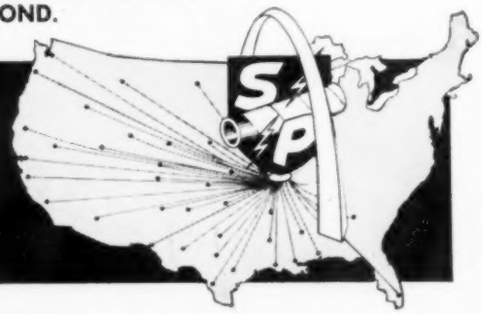
WARM PIPE LEAVING WHEELABRATOR AND PRIMING BOOTH IN TEMPERATURE CONTROLLED ROOM.

In SPI's plant, all moisture, rust and scale is removed from your pipe by warming and steel grit cleaning in temperature controlled rooms. The primer is applied immediately to seal out all dirt, dust and moisture. The steel grit cleaned surface of the clean, dry pipe, made up of many tiny facets, provides ideal and long lasting bond of the enamel to the pipe.

Field conditions prohibit such exacting procedures. Wire brushing does not produce the many tiny facets needed to provide ideal bond. Moisture may condense on cold pipe and dirt and dust carried by the wind may collect on it before the primer is applied. When the pipe is jeeped, this dirt and moisture may not show up as holidays, but later, when field c/w pipe is underground, costly holidays may result because of poor bond.

REMEMBER, YOU CAN JEEP ENAMEL BUT YOU CAN'T JEEP ITS BOND.

THROUGH FREIGHT RATES AT THE ST. LOUIS GATEWAY



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To celebrate its first birthday

THE D9 GETS INCREASED HP

—more power for your operation!

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(FLYWHEEL)

formerly 286 HP

260 HP
(DRAWBAR)

formerly 230 HP

The giant Turbocharged CAT* D9 Tractor, which since its introduction last year has set new performance standards in the field, now packs more power than ever to handle even bigger jobs. Its drawbar capacity has been increased from 230 HP to 260 HP—its flywheel horsepower from 286 to 320!

This increase in power reflects Caterpillar's policy of leadership in action. Combining research with practical field experience, there's constant product improvement to meet your needs for bigger production at lower cost. This policy applies to *every* product in the Caterpillar line—Diesel Engines, Tractors, Motor Graders and Earthmoving Equipment.

Now, with its increased horsepower, you can give the D9 tougher jobs than ever before. To match your requirements, it's available with torque converter or direct drive with oil clutch. For complete details about the more powerful D9, see your Caterpillar Dealer. Name the date—he'll be glad to demonstrate!

Caterpillar Tractor Co., Peoria, Illinois, U.S.A.

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For effective, long-term protection against corrosion . . .

Close-up of Transhield Asbestos Pipe Line Felt, showing parallel-spaced glass yarns.

Coating and wrapping pipe line to check corrosion and assure long-term service.

. . . use Johns-Manville TRANSHIELD® ASBESTOS PIPE LINE FELT

Johns-Manville Transhield is an economical pipe line felt assuring effective, long-term protection against corrosion under average soil conditions.

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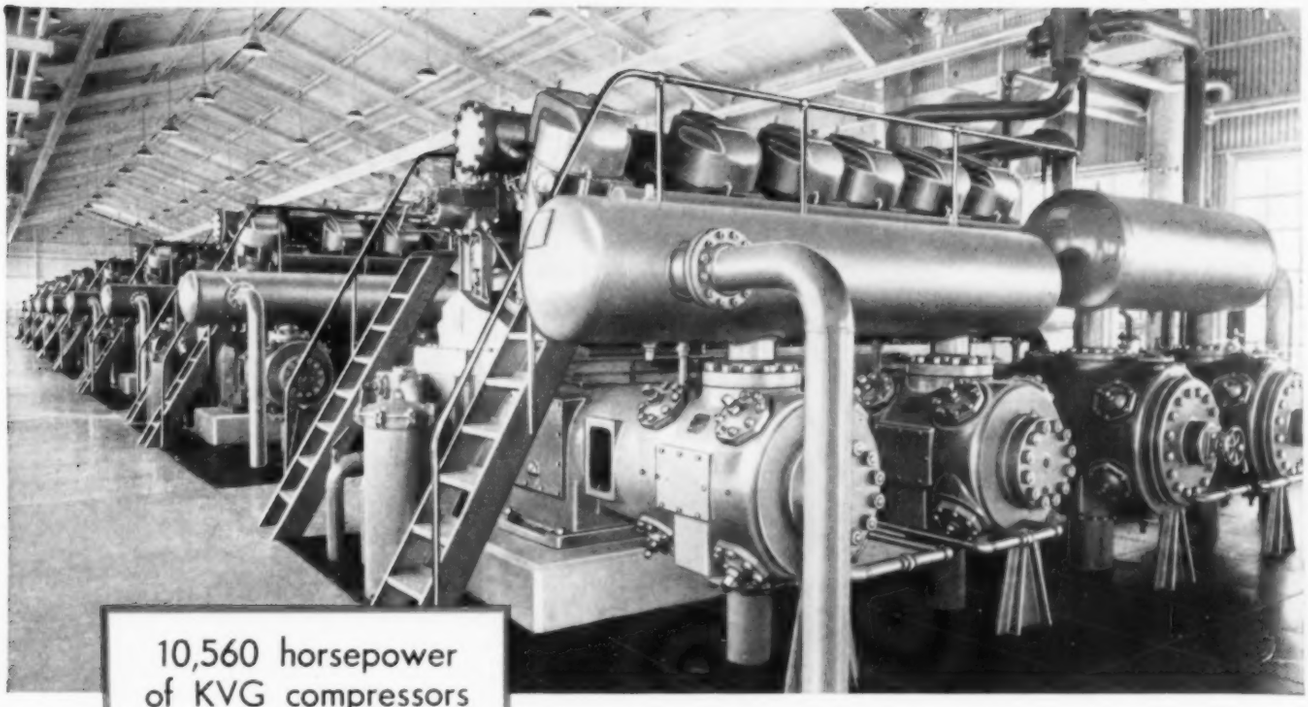

10,560 horsepower
of KVG compressors
at
Permian Basin
Pipeline Company

These eight Ingersoll-Rand KVG gas-engine compressors provide a total of 10,560 horsepower for a gas compression station of the Permian Basin Pipeline Co., a subsidiary of Northern Natural Gas Company. Each machine consists of a 12-cylinder, V-type, four-cycle gas engine with four compressor cylinders mounted on the same frame and driven from a common shaft.

On any service

I-R Gas-Engine Compressors

offer two basic advantages

Wide load fluctuations are unavoidable in many compressor applications. That's why the *flexibility* of **I-R FOUR CYCLE** gas-engine compressors is a big asset. They always deliver smooth, steady power all the way from no load to full load and at any speed from half to full rated rpm.

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Ingersoll-Rand four-cycle gas-engine compressors are available in sizes from 110 to 2000 horsepower. Call in your I-R representative when planning your next installation. His experience can save you time, effort and expense all along the line.

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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO-BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

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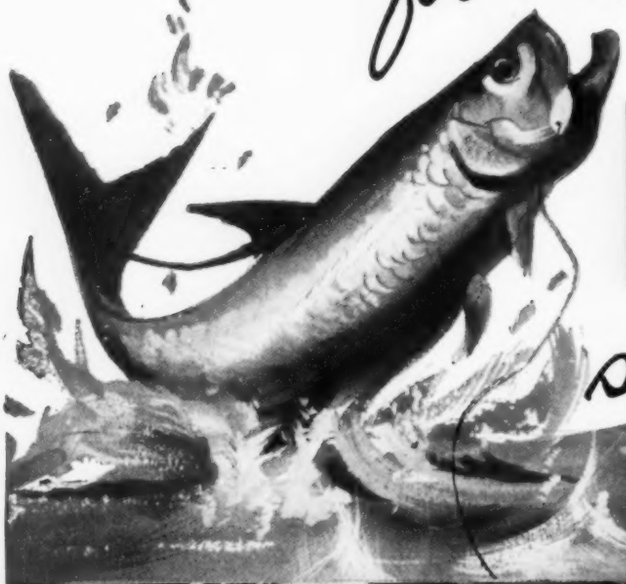

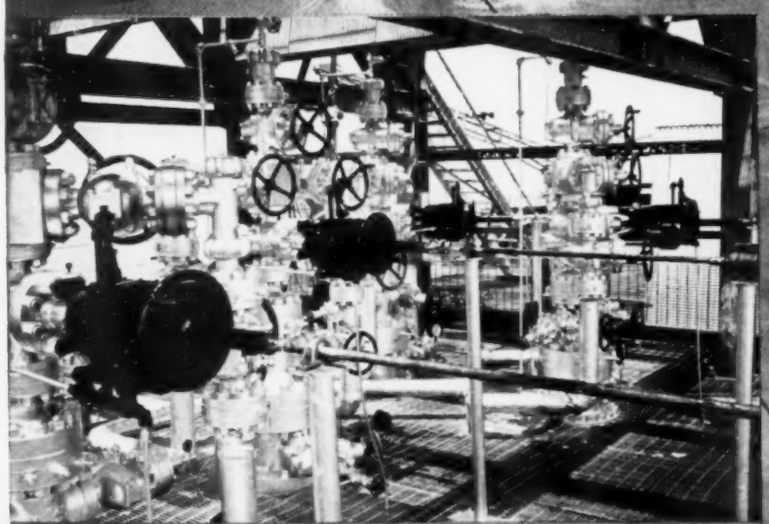

It's just like fishing with a heavy test line when you install E-I-M Valve Controls. You can be sure that the well won't get away from you because E-I-M has a record of safety and dependability. Our engineers can solve your transmission problems with E-I-M Valve Controls for oil or gas lines off shore or across the continent.

The Pure Oil Company's platform in Rollover Field, 9 miles off the Louisiana coastline, has four producing wells, each using an E-I-M Valve Control for maximum safety to protect personnel and the platform.

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A HEAVY-DUTY 3/4 YD.

PIPELINER

LORAIN 26

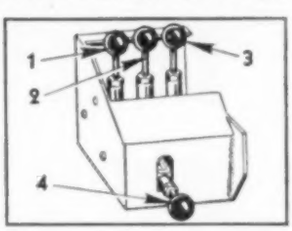
The Lorain-26 Pipeliner is the result of years of field study, experience and testing. On job after job, the following features have proved to be the things most needed for rough, tough pipelining work. Lorain "E-Z" Controls reduce operator effort by 70%. Hydraulic Power Crawler Controls (see right) add further to ease of operation, make it easy and fast to move crawler as digging progresses. Independent travel is also available. A longer, stronger 19-ft. gooseneck boom gives maximum digging ranges, digs harder materials. Larger 18" clutches result in faster, smoother response, longer clutch life. Idler rollers on anti-friction bearings are nylon sealed for protection against mud or sand. Wider, 2-speed crawlers are equipped with 29" treads. A new shell lagging takes larger drag-in cable for longer cable life.

There are many more facts you should check in the heavy-duty 3/4-yd. Lorain-26 Pipeliner. Your Thew-Lorain Distributor can tell you what every feature means in terms of performance—and profits!

THE THEW SHOVEL CO., LORAIN, OHIO

NEW... Hydraulic Power Crawler Controls

Here's more operating ease and quicker response in the new Lorain "26". From the operator's cab — with turntable in any swing position — the operator simply flicks these levers—and these actions take place immediately . . .



1. HOUSE LOCK is engaged promptly by power and released instantly by this handy, easy-acting lever, to prevent side motion of turntable.

2. SWING AND TRAVEL JAW CLUTCHES are selected and engaged by simply flipping this lever . . . push forward to travel . . . pull back lever to swing.

3. LOCKING PAWLS, now fully enclosed and mud protected, are instantly engaged and released by fast-acting power.

4. CRAWLER STEERING is power controlled by a single short lever — no operator effort, no fatigue. Either right or left steering is effected while traveling forward or backward, with turntable in any position of swing.

THEW-LORAIN® 26 PIPELINER

For more data on advertised products, use Readers' Service Cards, last page.

Here's dragshovel performance that helps keep trenching on schedule

Shown here are three of five Bucyrus-Erie 22-B dragshovels at work laying a 24-in. gas line across Pennsylvania.

Bonus Quality saves you money

When you equip an experienced pipeline crew with Bucyrus-Erie dragshovels, you've got a combination that keeps trenching and backfilling on schedule. No one knows this better than the men in the field, for they have seen these Bucyrus-Erie advantages at work —

There's high speed on the hoist and swing, as well as full power on the digging stroke for those heaped, quick-filling loads. The cambered mid-section of the boom provides added clearance for digging deep trenches . . . makes dumping easy because dipper can be raised high and brought in close without spilling the load. The dipper has sloping sides, side cutters with straight edges, and extended lip area for clean loading and dumping.

Tractor-type crawlers are available, too, for top mobility. They raise ground clearance enough to permit travel over most obstructions normally encountered . . . provide added traction for climbing grades as steep as 30 per cent where footing is adequate.

See your Bucyrus-Erie distributor soon for the complete story on ½-yd. 15-B and ¾-yd. 22-B dragshovels . . . and give your crews the kind of equipment they need to keep pipe lines moving on schedule. 238E56

Bonus Quality This laboratory technician is measuring the carbon content of a piece of steel . . . just one of the many tests given all steel at Bucyrus-Erie. Such testing helps insure Bonus Quality that saves you money — in operating and maintenance costs, as well as in longer service life.

BUCYRUS ERIE

SOUTH MILWAUKEE, WISCONSIN

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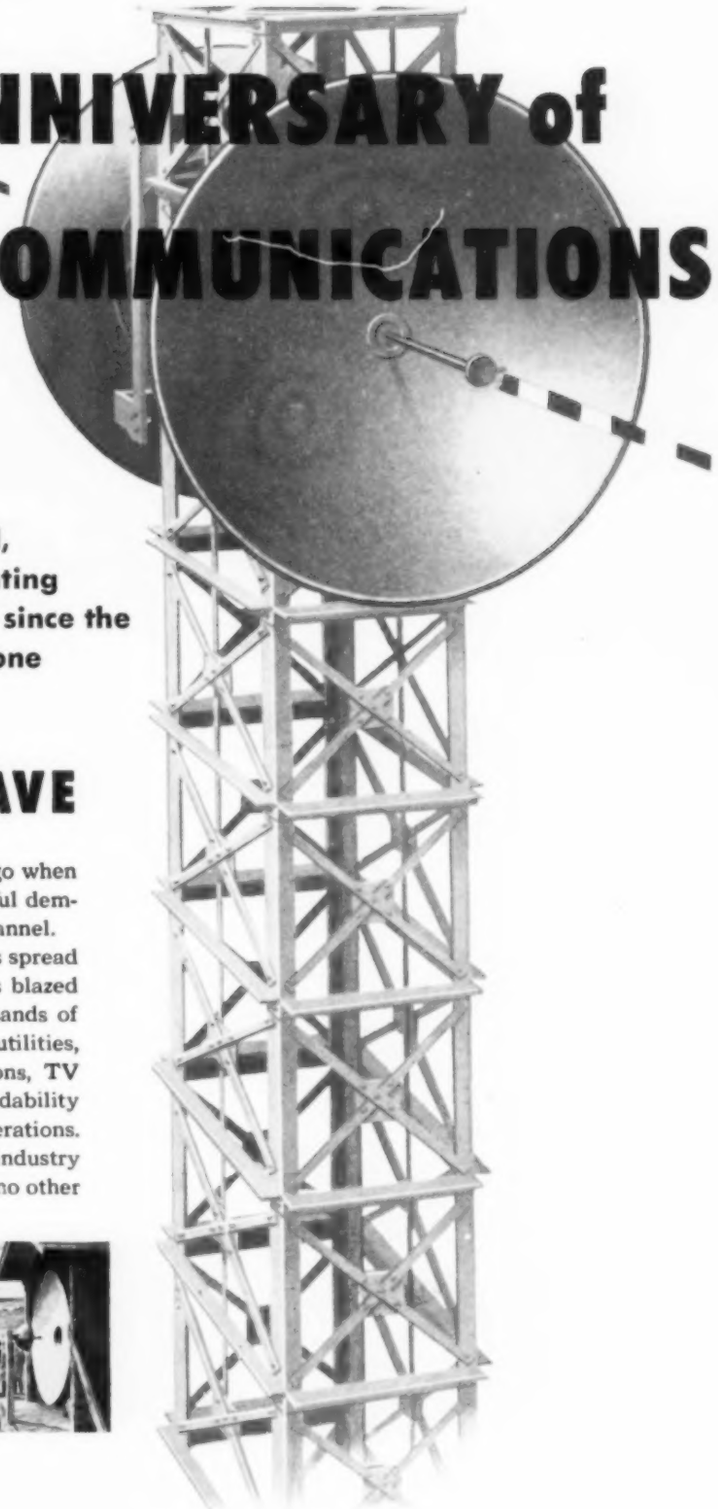

...PIONEERED in 1931 by IT&T

Today, all the world-wide technical, manufacturing, installation and operating experience gained by IT&T engineers since the birth of microwave is now available in one great system—

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Announcement!

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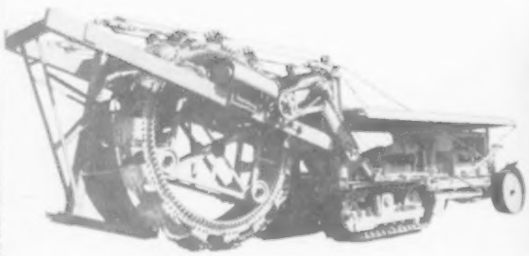
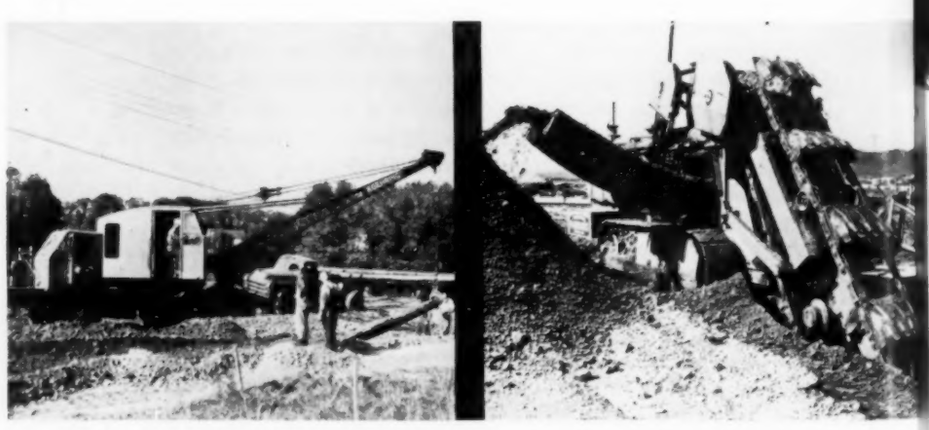
CRUTCHER-ROLFS-CUMMINGS, INC.

join hands to bring

Pipe Line Contractors

the world's finest manufacturing and distribution of pipe line excavating equipment





A combination for your benefit . . . the manufacturing talent of Koehring-Parsons Co. and the engineering knowhow and thorough distribution services of Crutcher-Rolfs-Cummings, Inc. Under a new arrangement, Crutcher - Rolfs - Cummings, Inc. is now the exclusive distributor in the pipeline contracting field for the Koehring-Parsons complete line of excavating, lifting and trenching equipment. Koehring has acquired the designs and manufacturing rights to the famous C-R-C Big Incher and Middle Incher ditching machines which will be built at Newton, Iowa by the Parsons Co. and sold exclusively through the C-R-C organization. C-R-C, for more than 20 years a leader in the pipeline equipment field, offers to pipeline contractors a complete line of excavating equipment. Koehring has been manufacturing construction equipment since 1906.

PARSONS CO. NEWTON, IOWA *(Koehring Subsidiary)* **KOEHRING CO.** MILWAUKEE, WIS.

Puzzled about getting the Right Explosion-Proof Lighting Equipment?

Only Crouse-Hinds has everything you need

...in every class ...in every group!

For *complete* protection when making lighting installations in hazardous locations you need more than explosion-proof or dust-tight lighting fixtures. You also need UL-listed explosion-proof switches, junctions, fixture supports, unions and seals.

Crouse-Hinds now offers a broad selection of Condulet* explosion-proof lighting equipment for Class I, Groups A and B locations. In fact, you can specify complete Crouse-Hinds explosion-proof lighting installations, all UL-listed, *no matter what class or group of Article 500 of the National Electrical Code is involved.*

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Design Factors in Telemetering Systems

Four important points to consider in planning for remote measurement or recording

A BRISTOL APPLICATION NOTE

Telemetering systems provide a proven way to keep tabs on a remotely located process, pipe line, service or utility. In fact, any time remote indication recording, or control is required, telemetering can serve your needs.

Here are the four conditions which must be considered in selecting the best telemetering system for any installation.

1. VARIABLES

Most industrial variables can now be measured, computed, and converted into a form that can be transmitted electrically. Their number and variety influence circuit complexity and the appearance of the receiving panel. Some variables now being successfully telemetered include:

Pressure • Current and voltage • Temperature • Flow • Electrical power • Wind velocity • Liquid level • Motion • BTU's • pH Horsepower • Speed

2. FREQUENCY OF READING

While the majority of telemeter systems in service today are the point-to-point continuous recording type, complex networks and interrelated variables are making sophisticated approaches more and more necessary. The problem usually boils down to these questions: how often is measurement necessary, and what is the least costly way to install and run the system?

Five types of possible hook-ups are:

Continuous recording—where variables are critical and need constant watch.

Intermittent indicating—where variables need only be checked at intervals.

Continuous-Intermittent—where it is possible to separate more critical variables for constant and intermittent telemetering.

Grouped-Multiplex—where several measurements can be transmitted as a group over a single circuit into a "multiplexed" receiver.

Successive-Multiplex—where measuring points over a large area can be "multiplexed" at intermediate locations, then herded to the panel.

3. TERRAIN

The type of interconnecting circuit between the measuring transmitters and central panel usually depends on the terrain: its topography, weather, and degree of settlement. Hence, signals may be carried by one, or by combinations, of the basic transmission media:

Radio—various types of radio can be used to take signals over mountains, deserts, and seas.

Wire—strung wire or leased lines can cover plant, urban, and rural areas.

4. INSTRUMENTATION

Bristol Metameter® Telemeters are eminently adapted to any of the conditions of measurement frequency, variables, or terrain likely to be encountered in telemetering. Transmission can be provided over telephone circuits, carrier current, radio—including microwave, VHF and UHF—and private wires, multiplexing and selective calling. Under all sorts of conditions, thousands of installations, ranging from just a few to hundreds of instruments each, have proven the dependability and reliability of Bristol Telemeters—pulse width (or duration), differential transformer, and voltage types, as well as pneumatic systems.

For more information on how Bristol Telemeters can benefit *you*, write THE BRISTOL COMPANY, 114 Bristol Road, Waterbury 20, Conn. 5.44

TYPICAL RECEIVING CENTER in multiplexed telemetering system.

BRISTOL *POINTS THE WAY IN HUMAN-ENGINEERED INSTRUMENTATION*

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

Your Wickwire Rope distributor and our steel melter... always at your service

This steel melter—at Wickwire's open hearths where wire rope steel is made—is with your Wickwire Rope Distributor every time he makes a call.

True, he's physically at the open hearth compounding steel with the sharp eye of an expert. But your Wickwire Distributor makes his call with the full assurance that the steel in Wickwire Rope has the right chemical content and grain size because it's always produced under rigidly controlled conditions by experts.

It's just one more reason why your Wickwire Rope Distributor knows he's got top-quality rope, slings and strand to sell . . . and that these products will serve you well.

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For YOU . . .

AN IMPORTANT MESSAGE!

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Pipeline Construction Equipment

Rental Firm Supplying Contractors

NEW OWNERSHIP, MANAGEMENT, POLICIES

The multi-million-dollar investment in the world's largest and most complete stock of equipment for pipeline construction was acquired July 2nd, 1956, by Brazos Equipment Rental Company from Anderson Bros. Corporation, formerly the world's biggest pipeline contractor. This tremendous inventory of equipment is now under new ownership, new management and new policies which you will like.

EQUIPMENT RENTED TO CONTRACTORS

Brazos Equipment Rental Company offers this late-model equipment—of every type needed for pipeline laying, land clearing, road building and other heavy construction—to pipeline contractors for rental . . . or on a rental-purchase, sale, or trade arrangement, as you prefer.

EQUIPMENT NOW IN SEVEN STATES

Now located in Texas, Montana, Wyoming, Minnesota, Louisiana, Ohio and North Carolina, this modern equipment can be moved to your jobs anywhere in the United States, Canada or Mexico.

ALL TYPES OF EQUIPMENT AVAILABLE

Machinery of every type . . . from generator units of 10 to 1000 k.w., up to complete spreads for pipeline construction . . . can now be rented by contractors on a profitable basis. With more than 85 crawler tractors for various applications to choose from, and the largest stock of winches, welders and other pipeline machinery ever assembled—spreads of any magnitude, even difficult river crossings, are now within every contractor's bidding range!

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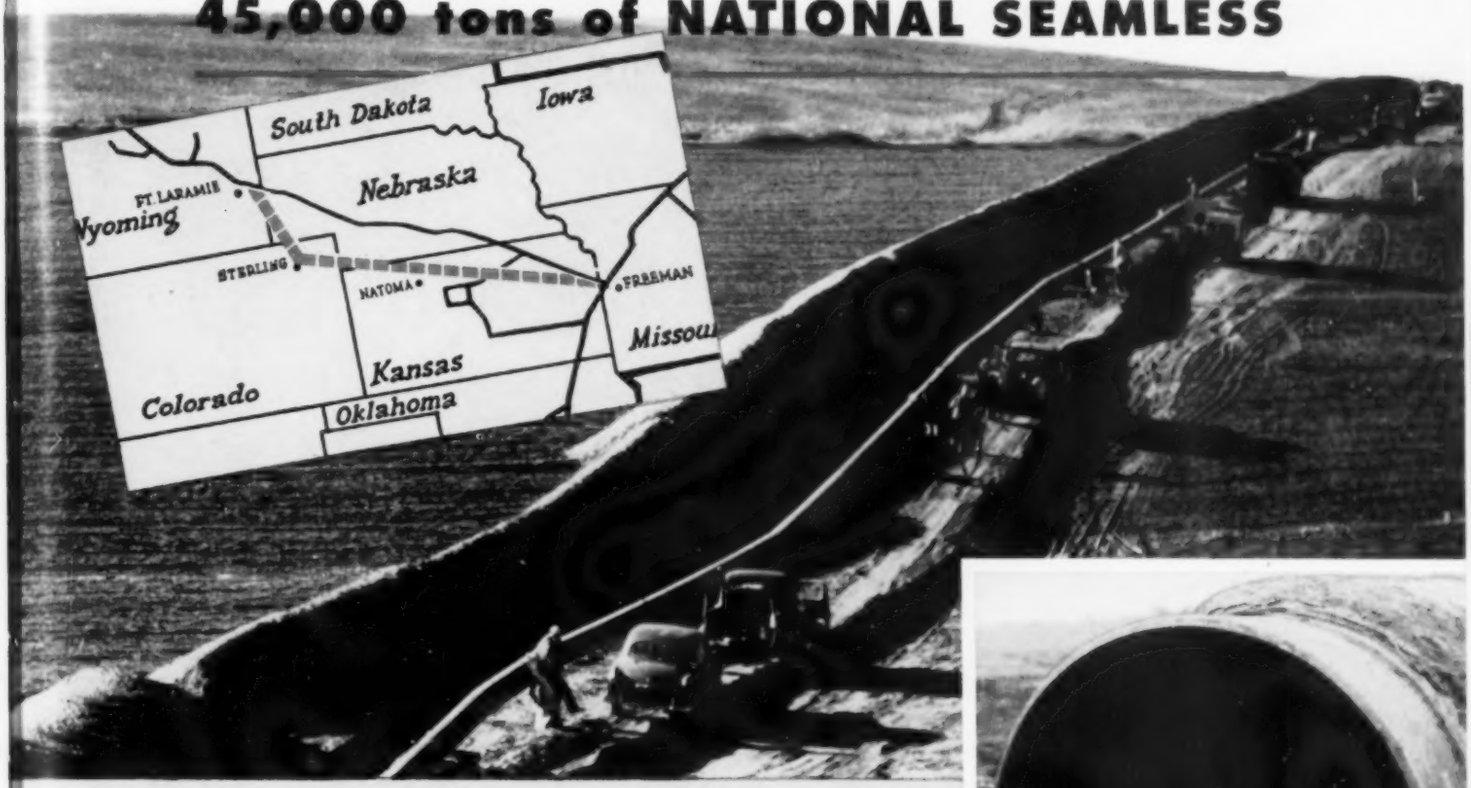
SERVICE PIPE LINE'S 625-MILE "BIG INCH"

from Wyoming to Missouri contains 45,000 tons of NATIONAL SEAMLESS



Pipe welders at work on the rolling fields of Kansas.

USS National Seamless Pipe—45,000 tons of it—in sizes 20", 22", and 24" O.D. are now helping to carry millions of barrels of crude oil from the Rocky Mountain producing areas to midwest refining centers.

Starting at Fort Laramie, Wyoming, the new line runs through the Denver-Julesburg Basin of Colorado and Nebraska and is linked to west Kansas producing fields. It ties into Service Pipe Line Company's main North-South system at the western edge of Missouri.

The present outlet capacity is 160,000 barrels per day. It can be economically expanded to 245,000 barrels per day. Initially, more than 1,500,000 barrels of oil were required to fill the line.

The installation of this line brought about a new pipe-laying record—an average of over 10 miles a day. Eight spreads welded as high as 108.6 miles of pipe in one week, and up to 17.4 miles in a single day! This is a tremendous accomplishment in view of the fact that the line passes under 49 highways, countless roads, 21 railroads, eight major rivers, and spans innumerable irrigation ditches.

A section of 24" O.D. x .500" wall National Seamless Pipe, coated for the Solomon River crossing. The covering consisted of a dope primer impregnated with fibre glass paper and coated with two inches of cement.

This type of rugged service calls for exceptionally strong, uniform, flexible pipe that will endure crushing underground and underwater stresses. And most important — it must be pipe that can be depended upon to give long, trouble-free service. This is USS National Seamless Pipe, "Walls Without Welds" . . . and these are the reasons why it is chosen so consistently to do the job.

In Pipe Lines Too . . . Seamless Does It Better

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USS

NATIONAL SEAMLESS PIPE AND TUBES

UNITED STATES STEEL

Pipeliner specializes on shorter runs, effectively uses Cleveland 320 trencher and 190 backfiller

On a 31-mile, 36-inch gas line for Natural Gas Storage Co. of Illinois, these two Clevelands—a "320" trencher and a "190" backfiller—were effectively employed. The line runs from the company's storage and compressor station at Herscher to a tie-in point near Devine on Texas-Illinois' main line. Construction was done by Contracting and Materials Company of Evanston, builders of many short length and smaller diameter lines in the frequently difficult pipelining conditions encountered in the Chicago area. Today, pipelines of all sizes and lengths—long and short, large diameter and small—are being more efficiently dug by Cleveland 320's and better backfilled by Cleveland 190's.

Good Everywhere

THE CLEVELAND TRENCHER COMPANY

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PIPE LINE PANORAMA

Steel Shortage Hits Pipe Lines . . . History is repeating itself. As in steel strikes of '49, '52, '55—strike-bound steel production has again taken its toll in new pipe line construction.

One big casualty is Trans-Canada Limited, reported to have available 115 miles of 34-inch pipe for natural gas line from Burstall to Winnipeg. Completion of line in '56 depends on whether steel strike will prevent delivery of 460 miles of pipe before construction season ends this fall.

In the U. S., line pipe shortage forced Colorado Interstate to stop construction on 238-mile final leg of its 380-mile, 22-inch gas line from Rock Springs, Wyoming, to Denver—after only five miles of pipe had been laid. The company hopes to resume pipe laying about Mid-August—when new pipe shipment is due.

On the other hand, Pacific Northwest reports it is in good shape, steel-wise. Reason: Pipe is still coming in and will continue to until contract expires August 30. There is no indication of effect strike will have on PNW's new 350-mile crude and gas products line from San Juan Basin to Salt Lake City. Pipe has not yet been ordered.

Also in good shape now because of ample advance pipe deliveries, are Transco and Tennessee Gas Transmission.

•

Complete Automation for Gulf Interstate? . . . Company engineers are high on new satellite station's economy, efficiency and dependability. After 5000 operating hours, only 9½ hours down time were reported—station has shown 10 to 15 percent savings in operating cost alone. Predictions are that new Gulf Interstate stations will be completely automated by '58.

Plastic Tape Cuts Current Costs . . . Early corrosion field studies along Gulf Coast show polyethylene plastic tape to have very low electric current demands. Only 74 milliamperes were required to protect the 12-mile section—comparing very favorably with conventional coating systems. Corrosion engineers will keep close watch on its performance when tests begin on 122-mile section of American-Louisiana's 22-inch line from Defiance, Ohio, to Bridgman, Michigan.

•

Russia Has a Long Way to Go . . . An exclusive report to PIPE LINE INDUSTRY reveals that last year 53 Russian cities were supplied with natural gas—and the '56-'60 five-year plan calls for 46 more cities.

In '55 Russia used 353 million cubic feet of natural gas—by '60 total is expected to reach 1.4 billion cubic feet. In comparison, U. S. marketed natural gas production totaled 9.3 trillion cubic feet last year.

Most important natural gas pipe line under construction is from Moscow to Stavropol. It will be 814 miles long and 27.55 inches in diameter.

•

Pipe Line Construction to Set New Records . . . Gas utilities and pipe line companies in U. S. are heading toward record-breaking year in new construction and expansion of present facilities. Total for '56: $1.6 billion compared with $1.345 billion last year.

From '56 to '59 construction spending is expected to reach $7.3 billion, greatest sum expended in any previous four-year period. About 96 percent of expenditures will go for natural gas system facilities.

Lowering in near Moab, Utah. Sand bags were used to protect the asphalt coating on the bottom of the pipe. Contractors had the option of using six inches of rock-free soil all around the pipe or to put on a rock shield wrap. Over 35 percent of the ditch in Colorado, Utah, Wyoming and Idaho required some type of trench padding.

2400-Mile Line Pushes Gas Frontier to Pacific Northwest

Sound engineering design plus the perseverance of contractors big factors in laying new line across toughest pipelining obstacles met in the U. S.

By MELVIN A. JUDAH
Editor, PIPE LINE INDUSTRY

THIS MONTH will mark the arrival of natural gas service into the Pacific Northwest when a symbolic flare is ignited at Portland, Ore. It signals, too, a remarkable record in pipe line construction. Since the first joint of pipe was laid July 8, 1955, Pacific Northwest Pipeline Corporation has put over 1900 miles of pipe into the ground. All of the 1471 miles of main line and nearly 900 miles of laterals are scheduled for completion this year.

The Pacific Northwest line crosses practically every kind of natural obstacle to deliver gas from the New Mexico-Colorado San Juan Basin and Canada to the last major area not now served. Spreads have crossed several ranges of mountains, rivers, plains, irrigated farm lands and some rocky wastelands that were virtually deserts.

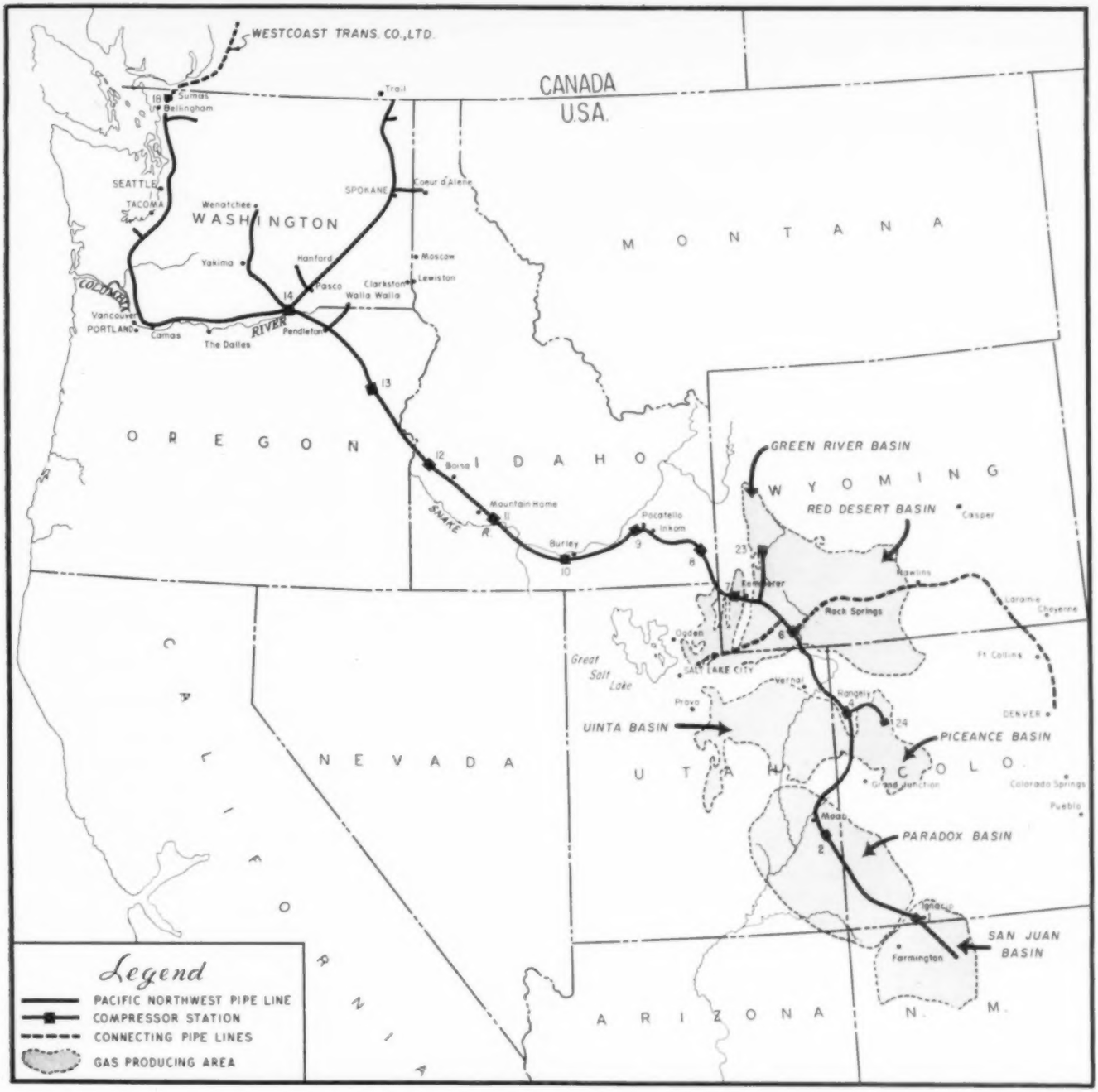
How It All Started. The Pacific Northwest dream actually began to take shape in 1949 when Ray C. Fish, head of Fish Engineering Corporation, and Robert R. Herring made an initial market survey of the Pacific Northwest area. Soon after, an application was placed before the FPC for authority to build the line. Lengthy hearings were finally resolved on June 18, 1954; financing and pre-construction planning were finished by July, 1955, when actual construction began.

As originally authorized, the system was to consist of 1466 miles of main line to move 343 million cubic feet of gas daily from the San Juan Basin and other fields along the route. Of this amount 243 million cubic feet were designated for the Northwest. A 1954 follow-up market survey disclosed that the area served would require additional supplies of gas.

On Nov. 25, 1955, the FPC authorized Pacific Northwest to import 300 million cubic feet of gas per day from Canadian sources requiring the expansion of facilities in Washington state. This hiked main line length to 1487 miles and sales and supply laterals to nearly 900 miles. With financing completed on the expansion program, Pacific Northwest capitalization was brought up to nearly $217 million.

Where Will Gas Come From? Principal sources of gas for the system will now be the San Juan Basin of New Mexico and Colorado. An extensive drilling program aims at a goal of 300 million cubic feet for the southern terminus of the line. Pacific now has over 200 commercial wells in the area, and holds leases on over 480,000 acres of proved reserves. Additional U. S. supplies will be purchased from the Piceance Creek and Rangely fields in western Colorado and the Big Piney field in Wyoming.

To complete the present gas supply picture, Pacific has a long-term



2400-mile Pacific Northwest system crosses rugged terrain of Rocky Mountains to deliver San Juan Basin gas to the northwest—last major industrial frontier for natural gas in the U. S.

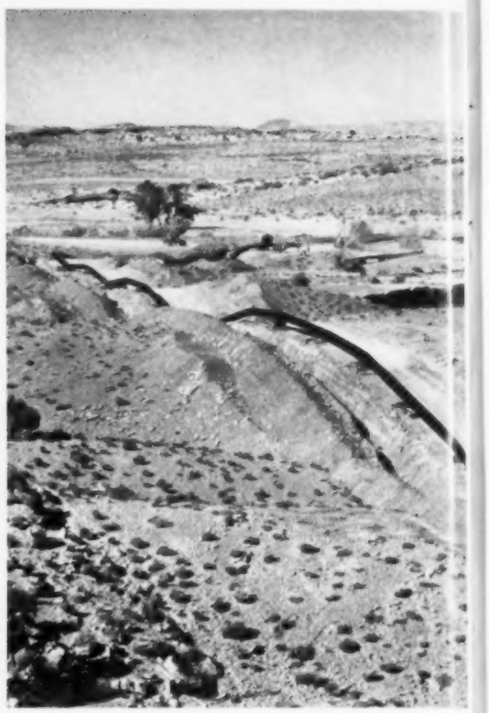
contract with Westcoast Transmission Company, Limited, to import up to 300 million cubic feet per day from the Peace River Fields of northern Alberta and British Columbia. By 1958, the system will be taking 643 million cubic feet per day from the dual supply. Of this, 100 million cubic feet will be allocated to Colorado Interstate Gas Company.

As part of the Canadian agreement, Pacific Northwest will deliver 50 million cubic feet of gas per day to El Paso Natural Gas Company in the San Juan Basin on an exchange-displacement basis for a like volume of Canadian gas which El Paso would purchase from Pacific at the International Boundary near Sumas, Wash.

Construction Pace Sets Records. Actual building of the Pacific Northwest system is being handled by Fish Northwest Constructors, Inc., agents for the turnkey job. When it is completed, many of the experienced men with Fish Northwest will transfer to operations with Pacific Northwest.

Every Type of Terrain. From the southern terminus at Ignacio, Colorado, the 26-inch line crosses the rocky Colorado plateau and eastern Utah to Green River, Wyo. A connection with Colorado Interstate Gas Company near Rock Springs, Wyo., will take gas for delivery to central Colorado markets. From Rock Springs northwestward, a 22-inch line crosses southern Idaho and the northeastern corner of Oregon to tie in with another 26-inch line at Umatilla Junction, Oregon. From Fort Bridger,

R. H. Fulton's ditching crew moves north toward Douglas Pass in Colorado. Rocky soil is typical of a good portion of the Pacific Northwest right-of-way. Trailing scraper shoved back small rocks and boulders from edge of ditch, saving a lot of ditch clean-up time.



Pacific Northwest's line crossed rivers, streams, canyons, and arroyos. Inspectors made sure the pipe rests hard on the bottom of the sags in this kind of country; overbends rode high. Here a section of Schedule 3 is coated and wrapped near Moab, Utah.

Builders of the Pacific Northwest Main Line

Contractor	Schedule	Mileage & Size	Location
River Construction Corp.	1	70.66 mi. of 26"	Ignacio, Colo., to Dove Creek, Colo.
	2	79.63 mi. of 26"	Dove Creek, Colo., to Moab, Utah
	18	63.66 mi. of 26"	Winlock to Buckley, Utah
R. H. Fulton & Co.	3	76.51 mi. of 26"	Moab, Utah, to point near intersection of Colo. River and Colo. line
	4	90.80 mi. of 26"	Point near interesction of Colo. River & Colo. line to Green River in N.E. Utah
Associated Pipe Line Contractors Inc.	5	72.75 mi. of 26"	Green River crossing No. 1 to Rock Springs, Wyo.
	6	80.91 mi. of 22"	Rock Springs, Wyo, to Wyo., Utah & Idaho junction
	21	57.11 mi. of 26"	Mt. Vernon to Sumas, Wash.
Montin-Benson Corp. & G. G. Griffis, Inc.-Curtis Constr. Co., Inc.	7	91.83 mi. of 22"	Wyo., Utah & Idaho junction to Lava Hot Springs, Idaho
	20	45.52 mi. of 26"	Near Issaquah, Wash. to Mt. Vernon, Wash.
Midwestern Constructors Inc.	8	90.79 mi. of 22"	Lava Hot Springs to near Burley, Idaho
	16	31.41 mi. of 26"	Near Columbia River to Point north of Camas, Wash.
	17	47.73 mi. of 26"	Point north of Camas to Winlock, Wash.
H. B. Zachry Co.	9	100.61 mi. of 22"	Point east of Burley, Idaho to Glenns Ferry, Idaho
	10	116.79 mi. of 22"	Glenns Ferry, Idaho, to Payette, Idaho
Fulghum Contracting Corp.	11	96.34 mi. of 22"	Payette, Idaho to La Grande, Ore.
	12	93.41 mi. of 22"	La Grande, Ore., to Umatilla Junction on Columbia River
A.P.V. Co., Inc.	13	81.46 mi. of 26"	Umatilla Junction to point west on river.
Engineers Limited Pipeline Co.	14	30.15 mi. of 26"	Along Columbia River in Washington
	15	25.37 mi. of 26"	Along Columbia River in Washington
Montin-Benson Corp. & G. G. Griffis, Inc.	19	37.92 mi. of 26"	Buckley to point near Issaquah, Wash.

Wyo., to Walla Walla, Wash., the right-of-way follows the historic Oregon Trail of pioneer days. The 26-inch line running from Northern Washington to Umatilla Junction will deliver the gas supplied by Westcoast Transmission Company, Ltd., from the Canadian Peace River fields.

Pipe for the main line is API Schedule X52, cold worked and expanded, and then continuously electric welded. Basic 26-inch pipe for normal cross-country line has a wall thickness of 0.281 inch, an ID of 25.438 inches and weighs 77.25 pounds per foot. It has been hydrostatically tested to over 1000 pounds per square inch at the mill. On the main line mid-section, the 22-inch pipe has 0.250 inch wall thickness, weighs 58.07 pounds per foot and is hydrostatically tested to over 1000 psi at the mill, also. Heavy wall pipe was laid at the nine river crossings at the Colorado, Snake, Green and Columbia rivers. Suppliers of pipe for the system are Consolidated Western Steel Division, U. S. Steel Corporation, Kaiser Steel Corporation, Republic Steel Corporation, A. O. Smith Company, and Lone Star Steel Corporation. Special heavy wall pipe was fabricated by Bethlehem Steel Company and the National

Tube Division of U. S. Steel Corporation.

Making ditch over many miles of mountainous right-of-way was a tough job. Drillers here prepare shot holes for blasting in the Diamond Mountain area near Vernal, Utah. Several spreads in Idaho used slow burning powder and diamond point bits to blast lava rock underlying the Snake River valley.

Weather Plagued Contractors. Just building a pipe line through the rugged country of the Rocky Mountain right-of-way would be a tough enough job, but the contractors who laid it had many unexpected obstacles thrown up by nature.

During the summer and fall of 1955, ankle-deep dust and sand slowed construction in the Colorado-Utah area. Visibility was cut to a few yards; contractors had to tow trucking equipment with tracked vehicles; sand and dust presented welding difficulties, and respirators were worn by many field men.

Spreads worked almost continuously through the mountain winter, building line in temperatures as low as 45 degrees below zero. Their endurance in weather and terrain hazards was often amazing. Weather was a paradox, too. For example, spring rains in Washington lasted as long as six weeks, making the right-of-way a quagmire. Just a few months later, tinder dry timberlands caused the State Forestry Commission to prohibit work in wooded areas on days when the relative humidity was below 30 percent.

During muddy spring weather state and county restrictions closed many of the state roads in Washington and Oregon, except for necessary residential use. This added more problems for contractors! Load limits had already been cut in half; and the emergency ban such as that introduced this year lowered it by one-third more. It gave the spreads a real problem in moving men and equipment to the right-of-way.

However, contractors' headaches, brought on by Spring floods, did reward the engineers and survey parties. They were able to locate and avoid slide areas loosened by heavy rains. It is very unlikely that the Pacific Northwest line will find much wetter conditions to cause future slides and soil shifts.

To complete the extreme weather cycle, winter construction encountered heavy snow storms and freezing temperatures as low as 45 degrees below

Nearly 20 percent of the right-of-way between Ignacio and Umatilla Junction required some blasting for ditch. Scenic restrictions demanded careful work in many areas. Near Arches National Monument, crews took special care not to disturb any of the rugged natural features of the monument.

Summer work began early and continued late. Another joint of 26-inch pipe is lined up on the main line in the desertlike area near Grand Junction, Colorado.

Construction continued on many of the spreads during the severe Rocky Mountain winter. Fulghum Contracting lines up joint of yard coated 22-inch pipe between Ontario and Umatilla, Oregon. Line and station work continued in temperatures down to 45° below zero and with 40-mile-per-hour winds.

Spring rains brought more headaches to contractors in Washington. Rains of about twice normal precipitation lasted for six weeks. Midwestern Constructors slogs through mud to lay 26-inch on Schedule 16 in southwestern Washington.

zero. Several spreads continued work through the winter except for a few of the coldest days. Valves were set in the Douglas Pass area of northwestern Colorado in midwinter. Manually operated lubricated plug block valves are set at approximately 15-mile intervals on the main line.

Near Douglas Pass the pipe line rises rapidly from an altitude of 4300 feet to 8200 feet within a short distance. Fish Northwest crews used bulldozers through 15 feet of snow in many locations. In others, four-wheel-drive jeeps were chained together to travel the mountain roads. Just a few miles to the northwest, the 55 miles between three Green river crossings which required 150 miles of driving in the best summer weather stretched out around the mountains to over 300 miles in midwinter.

At the Big Piney booster station, winter construction continued with the mercury as low as 45 degrees below zero. Gas from nearby fields was burned to provide heat for construction and maintain equipment in operation.

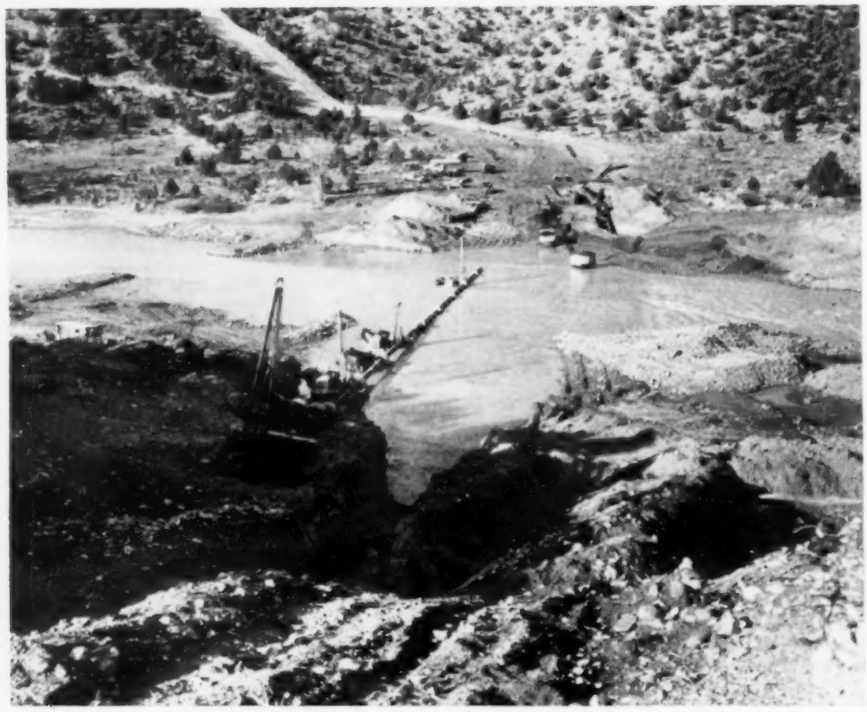
Station foundations were poured during the winter months; burners under tarpaulins kept the concrete at the proper curing temperature.

Another hazardous area in the winter was the Blue Mountain area of Oregon. Snow packed to depths of five feet on the level while tempera-

The first section of a dual 20-inch river line moves into the Colorado river near Moab, Utah. Four oil drums were lashed to the pipe at each concrete weight making the pipe weigh about 5 pounds per foot during the shove. Four sidebooms move the pipe with positive control.

Lead joint of the 20-inch Colorado river crossing was kept afloat during the shove. A tow line steadied the pipe against force of current as it moved out of the dredged side channel into the current at midstream.

End of a section of river line reaches the east bank of the Colorado river. Another section was stovepiped on and the shove continued until all four sections of the 1830-foot crossing were completed. When in position the oil drums were removed from the line so it could settle to the bottom with a negative buoyancy of 50 pounds per foot. Ditch was dredged to provide about 15 feet of cover on the Colorado crossing.



R. H. Fulton spreads walk a second 20-inch line across the swift Green river in northeastern Utah. Concrete river weights gave the pipe a negative buoyancy of 50 pounds per foot. No flotation was required for this shallow 643-foot crossing.

tures dipped to 26 degrees below zero and winds were high. In spite of these conditions only one spread shut down completely during the winter months.

Construction Innovations. Novel ideas were used in the mountainous terrain construction. Pipe stringing trucks were ferried across the Green river near Manila, Utah, on a barge made of portable pontoons locked together. This installation saved 80 miles of mountain hauling per trip. Five pontoons, interlocked together, gave Associated Pipe Line Contractors' ferry a capacity of 140,000 pounds. A ramp at each end speeded loading and unloading; a 16-horsepower double drum winch powered the ferry along a guide cable suspended from shore towers on the 400-foot crossing. The ferry made a trip every four minutes with a tractor and trailer loaded with five 40-foot joints of pipe.

After construction was completed, the ferry was sectionalized and loaded for truck movement by highways. It met with legal dimensions and weight limitations.

Landowners Pleased With Contractors. Right-of-way restoration is being carefully handled in cultivated areas; farmers have been happy with the way contractors have treated fields. Much of the line crosses valuable irrigated land and Pacific Northwest was careful to make every effort to maintain good public relations. Right-of-way was graded, terraced, and backfilled to the farmers' satisfaction. Debris was removed, fields were disked, and, where necessary, erosion ditches and dikes were built to keep the workover ground in top shape. Farmers could plow right over the line and plant crops without losing any productivity. Planting holds the topsoil and prevents washout and uncovering of pipe.

River Crossings Submerged. Most of the Pacific Northwest line passes through terrain with many minor rivers, streams and washes. There are really nine major crossings. The first one is a dual 20-inch line under the Colorado river near Moab, Utah. Within a 60-mile span in northeast Utah, the line crosses the Green river three times with dual 20-inch lines. Two dual 16-inch crossings are made across the Snake river in Idaho. The Columbia river is crossed three times; a dual 20-inch at Umatilla, a single 20-inch at Pasco, Wash., and a dual 16-inch near Portland, Ore. The 20-inch river lines have a 0.625-inch wall thickness. Clamp-on 1900 pound concrete river weights were used to give the pipe negative buoyancy where needed.

Several different methods were used to make the crossings. Where rivers were shallow, tractors walked sections across and lowered them in. On deeper crossings but where currents were not exceptionally swift, such as the Colorado crossing, pipe was shoved across and stovepiped in four or five sections. The tricky Columbia river crossing near Umatilla Junction was snaked across by a winch and cable assisted by tractors on the launching side. Pipe for this tough crossing was $^{13}/_{16}$-inch wall with a double application of asphalt, glass wrap, felt and rock shield.

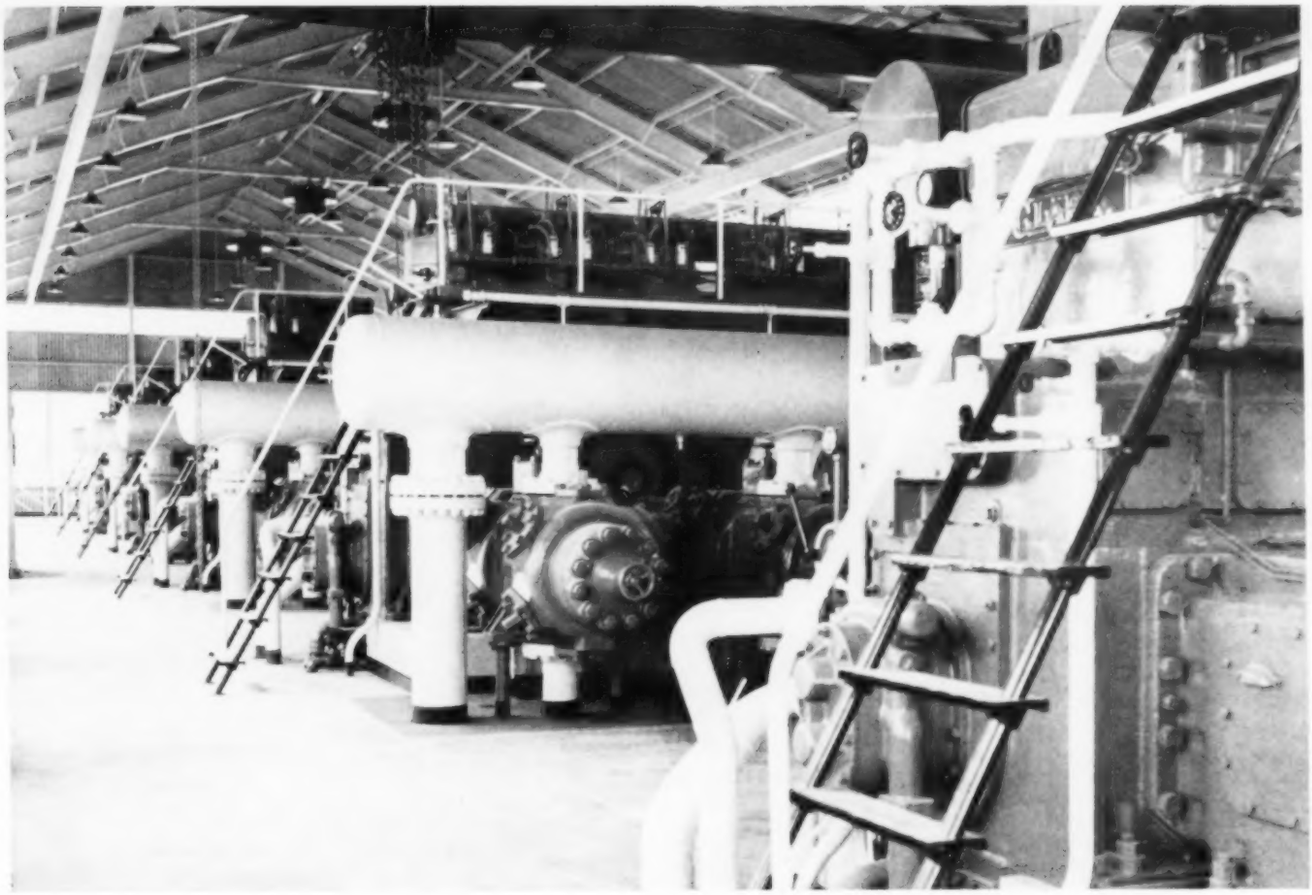
Pipe Watched Closely. Although much of the Pacific Northwest right-of-way crosses soils that are not likely to be too corrosive, it also traverses country that is double tough on a coating job. Some 20 percent of the ditch required blasting; up to 35 percent called for trench padding. To protect the pipe coating, sand bags were laid in the bottom of the ditch under the pipe. In addition, six inches of rock free dirt is used to pad the pipe all the way around it in the ditch. Some trench padding required long hauls.

Insulating flanges are being installed at proper design points on the system. Coating specifications call for primer, $^{3}/_{32}$-inch minimum thickness coatings of asphalt enamel and glass fiber wrap with Kraft paper. A rock shield wrap or trench padding was at the option of the contractor in rocky areas. River crossings were double coated. Cathodic protection systems will be installed on the system for complete protection after the backfill takes its set.

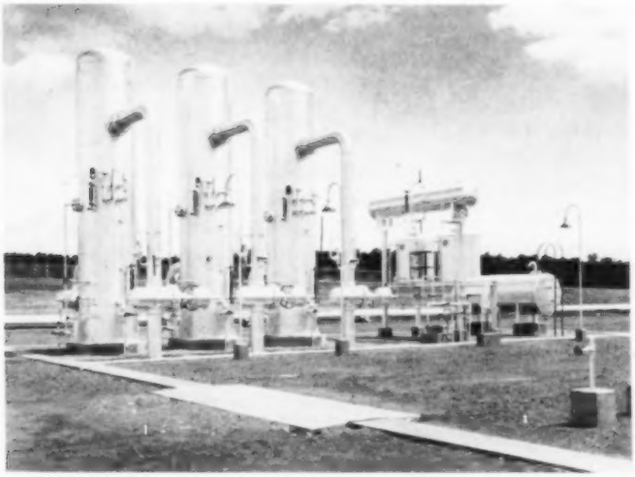
Compressor Stations are designed for high altitude, cold weather, and two-way service. Thirteen main line compressor stations on the Pacific Northwest system will supply a total of 82,780 horsepower. In addition, two booster stations utilize 5720 hp to compress gas from the Piceance Creek field and the Big Piney field for transmission.

Station No. 23 at Big Piney, Wyo., is at an elevation of 7325 feet above sea level, highest on the system.

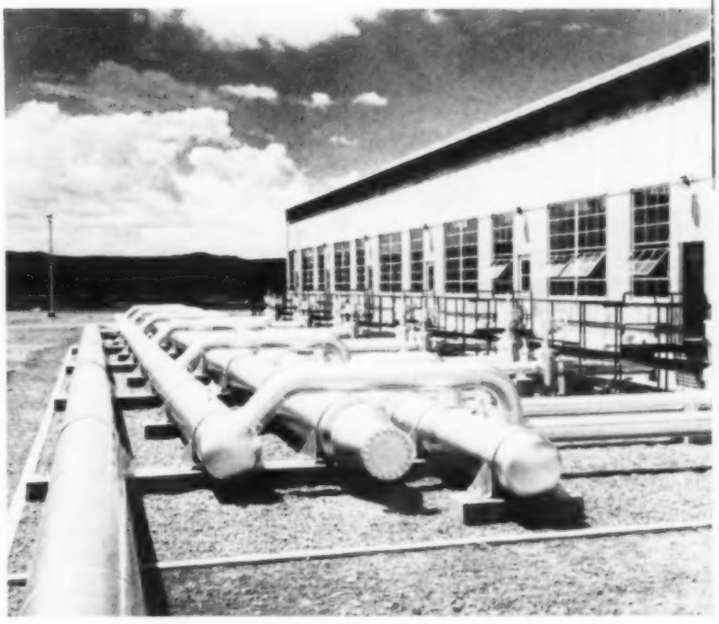
Five of the main line stations are above 6000 feet and eleven are located



Six 2000-horsepower reciprocating compressor units make Station No. 1 at Ignacio, Colorado, the largest station on the system. At 6626 feet the normal 12,000 horsepower rating has been cut to an actual 10,200 based on manufacturer's performance curves.



Scrubbers at Station No. 1 handle up to 300 million cubic feet per day operating at a pressure of 450 pounds per square inch. Design features include a patented oil-gas mixing section and automatic adjustment for variable gas throughput.



All manifolding at Station No. 1 is fabricated on concrete blocks above ground for ease of maintenance. Gas comes from the San Juan field at a suction pressure of 450 pounds per square inch, is compressed to 800 pounds and sent on to adjacent liquid products extraction plant.

at sites over 3000 feet. High altitudes require a large derating allowance for many of these stations, according to the manufacturers' design curves. A typical example of deration factors—at 6000 feet the deration factor is 0.814, so for every 1000 hp installed, the effective output would be only 814. Station No. 1 at 6626 feet has been derated from 12,000 to 10,020 hp. With six 2000-hp compressor units, it is the largest on the system. It will take gas from the San Juan field at a suction of 450 psi, pressure it up to 800 pounds, and send it to an extraction plant.

Unitized design is similar for all of

the stations with the exception of Station No. 1. An individual hydraulic oil pump and motor utilizes engine power to drive the air cooler fan. Jacket-cooling water is circulated by a chain-driven engine-mounted pump. An automatic temperature control valve operating on the hydraulic oil bypass maintains a preset water temperature as ambient temperature varies. Fan speed varies up to 390 revolutions per minute, depending upon cooling demands. Hydraulic oil pumps located below the station floor are driven from the engine flywheel by a V-belt drive. Cooling fans are driven by a hydraulic power unit through a right angle gear speed reducer.

Operation and control are simplified by combining jacket-water and the lube oil cooling water system for each engine. Some of the hot water from the engine jackets (170° F.) is bypassed to the air cooler and cooled to 120° F. Cooled water then flows to the lube-oil cooler, and on to the turbo-intercoolers. An engine mounted automatic temperature control valve regulates the turbo-intercooler water temperature; a three-way temperature control valve automatically regulates the hot-oil bypass to the oil cooler.

Main stream cooling water flows from the lube-oil cooler at 145° F. and mixes with 170° F. water from the hot water bypass. Hot water leaving the engine jackets flows to an individual surge tank inside the station; there it is pumped by the engine jacket water pump to the aerial fan type cooler outside, completing the flow cycle. Manual control of the jacket-water temperature regulating valve provides flexibility of control of jacket-water temperatures during extreme fluctuations of ambient temperatures.

This design feature permits jacket water cooling to follow closely the demands of the engine. There is no unnecessary cooling at startups and during cold weather. It combines advantages of lower installation costs, dependability, and is readily adaptable to automatic control.

Cold Weather Precautions. Extreme cold weather during winter calls for special design features. Some were simple, such as installing all jacket-water coolers on the south side of the compressor building. Extra efforts are being provided for prevention of hydrate formation. Gas will be handled at a lower dew point than would be normal in most transmission systems. Solid type, high capacity desiccants will be used to dry the gas. Gas will be cooled only at Station No. 1.

Water lines, of course, are buried well below the frost line. Meters and instruments outside stations will be protected by wooden frame insulated "freeze boxes." Antifreeze solution will be stored at the station, and will be injected into cooling systems by glycol pumps as needed. Station basements protect auxiliary units. A lube oil reservoir with a capacity sufficient for two engines will keep oil warm inside the building. Starting air tanks and jacket-water surge tanks are also sheltered.

Design Proved. High compression ratio units were installed to take advantage of both compactness and high efficiencies. Compression ratios are as high as 2.0. Reciprocating compressors were selected for flexibility in handling widely varying loads, changing compression ratios, and future expansion possibilities. Station piping pressure drop has been reduced as low as possible. Scrubbers, connecting piping, and valves were sized to minimize total drop, considering that only 1 psi pressure drop utilizes an equivalent of 40 horsepower.

All station piping is above ground on concrete supporting structures to do away with trenching, coating and increased maintenance problems. Oil bath type scrubbers were selected for a wide capacity range and also for removal of various size particles.

"Fickle Fourteen" will move gas in any direction. The unusual manifolding at Station No. 14 near Umatilla Junction will permit Pacific Northwest to take suction either way on the main line and deliver in varying capacities to the outgoing three lines. Four 1000-hp reciprocating stations will be installed there. It is designed so that gas can enter the station from the south and be pumped north; from the north and pumped south; or taken from both directions on the main line and pumped to the Spokane and Yakima laterals.

Emergency station shutdown meets codes. Each station's emergency shutdown equipment was designed to meet the rules of the Oil Insurance Association of the American Standards Association. Motivated by gas pressure, it will complete shutdown in this sequence:

- Stop all compressor engines by ignition cutout, grounding and fuel cutoff.
- Close the gas suction and discharge station gates to stop all flow into the station. The main line bypass will be manually operated to permit continued flow of gas in the main line.
- Power actuation of the blowdown valves releases all station gas pressure.
- Extinguish open-flame-fire devices where escaping gas might possibly be ignited. Open all electrical circuits.

High altitude operation will be watched with interest. There are actually some advantages that Fish Northwest engineers anticipate in the high altitude operation. Engines are rated on a basis of 110° F. at sea level. In the mountainous locations, they will actually be operating at much lower temperature, which should improve efficiency. Also, hot days when temperatures may reach near 100° F. would bring the low load demand.

Design considerations for bearing loadings, crosshead loadings, and other mechanical features are for the full power rating, so in reality each unit will have a built-in overload factor for mechanical parts.

Maintenance by aircraft. Maintenance centers will be located at frequent points along the line with crews on hand at all times. Light aircraft will be used to patrol the system for leaks, right-of-way damage, and possible hazards to the buried line. Larger company aircraft at Salt Lake headquarters are available to rush equipment and personnel to any trouble spot. After Canadian gas arrives, the line will have another unique feature. In case of damage to any section of line, only that section will be out of service and the remainder of the line may be served for some time from each end. This feature plus line pack should assure continuity of service while the damaged section is being repaired.

Communications system links com-

pressor stations, maintenance points and metering facilities. An extensive network of leased wire lines and VHF stations will integrate operation and control of the 2400-mile pipe line system. Headquarters at Salt Lake City will be the nerve center for the system with all dispatching activity centered at that point.

Later this year the permanent operating headquarters of Pacific Northwest will be moved to Salt Lake City, where a main office building is to be built. Over 500 employes will be needed to operate the completed system.

Industry Bolstered. Even before gas service reaches the northwest, several industries have taken action to make profitable use of the fuel. Pacific Northwest is itself taking an active part in stimulating this growth.

Together with Phillips Chemical Company, it has formed Phillips Pacific Chemical Company to build an anhydrous ammonia plant on the Columbia near Kennewick, Wash. It will be the first plant of this type in the area. An output of 200 tons per day of ammonia will utilize up to 15 million cubic feet of gas as feed stock. Phillips Chemical will operate the plant when operations start early next year.

Other industries, too, have already announced plans for using gas. Potlatch Forest, Inc., operators of a large pulp plant and the world's largest white pine mill, has contracted for gas to be used for fuel both at the pulp plant and the mill at Lewiston, Idaho.

Kaiser Aluminum and Chemical Company has contracted for a 20-year supply of gas for its Spokane plant. Aluminum Company of America has also signed for gas at its Wenatchee operations. Lehigh Portland Cement Company will take gas for fuel at three of its plants. Idaho Portland Cement Company, also will tie in for gas at its Inkom, Idaho, facility. As a result of Pacific Northwest's line, Chemical Lime Company is building a plant at Baker, Ore. Several pilot plants are doing research on the recovery of alumina from laterite using natural gas. All of these industrial growth opportunities promise to stimulate the industry expansion in the Pacific Northwest.

Pacific has an anticipated maximum day delivery of 393 million cubic feet of gas daily during its first year of operation. When importation of gas from Canada begins, this will be boosted to a maximum of 696 million cubic feet per day. A recent application with the FPC seeks an additional maximum daily sale of 117.5 million cubic feet to Colorado Interstate Gas Company at Green River, Wyo. If granted, this will require an expansion of facilities costing $26 million. Approval of applications now pending would increase Pacific's capacity to 800 million cubic feet of gas per day by 1958.

Key Men of Pacific Northwest

Fish

Williams

Silloway

Ricketts

Ray C. Fish, chairman of the board, has nearly 30 years of experience in oil and gas engineering and construction. He was a vice president of the Tennessee Gas Transmission Company, in charge of initial design, engineering, and construction of that system. As head of Fish Constructors, Inc. he led in the construction of the Transcontinental Gas Pipe Line Corporation system and the Texas-Illinois Natural Gas Pipeline Company. At the present time, as president of Fish Engineering Corporation, he also maintains active direction of associated Fish companies, including Fish Northwest Constructors, Inc., and Fish Service and Management, Inc.

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C. R. Williams, vice chairman of the board, professionally a chemical engineer with wide experience in the oil and gas industry. During 12 years with Continental Oil Company, he advanced to general manager of its oil and gas division. In 1942, became vice president in charge of operations for the Chicago Corporation, and joined Pacific in 1951, serving as president until mid 1956. As president, he directed the activities of Pacific during construction and formation of the new firm.

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Stuart F. Silloway, president, has an extensive background in financing and organization of many oil and gas projects. Formerly financial vice president of The Mutual Life Insurance Company of New York, he has had a broad and successful record with several outstanding New York investment groups. A science graduate and now trustee of Wesleyan University, he was named president in July, 1956.

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Allen B. Hiatt, vice president, engineer; a longtime employe of Phillips Petroleum Company as head of its natural gas department, chief engineer, staff director of engineering, and director of governmental regulations and technical advisor. Leading background in natural gas and natural gasoline engineering, pipe line design, market surveys, and gas contracts and sales.

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Arthur B. Allyne, vice president for operations, 30 years oil and gas work as research chemist for Shell Oil Company and later with Southern Counties Gas Company; and senior gas engineer with the California Railroad Commission. Following World War II, he became gas engineering consultant on staff of Ebasco Services, Inc. and served as project manager for the East Tennessee Natural Gas Company system; was assistant general manager of the Honolulu Gas Company, Ltd. and Pacific Refiners, Ltd. in Hawaii.

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Leon M. Payne, vice president and secretary, is an economist and lawyer experienced in oil and gas industry projects. Payne is also vice president of Spokane Gas and Fuel Company and assistant secretary of several Fish companies.

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Richard D. Ricketts, president, Fish Northwest Constructors, Inc. did engineering work with the Columbia Gas and Electric System and Panhandle Eastern pipe line during its pre-war expansion program. Since joining Fish Engineering has participated in managerial capacities on design and construction of the Transcontinental Gas Pipe Line and Texas-Illinois lines. He is one of the founders and a vice president of Fish Engineering Corporation.

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James W. Hall, project manager, Fish Northwest, worked at almost every kind of field job before entering the pipe line construction business for himself. Superintendent of construction on the Transco line and later was Transco pipe line superintendent.

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K. C. Biederman, construction superintendent, Fish Northwest, covered every job from surveying to resident engineer on pipe line construction projects with Panhandle Eastern. Division superintendent on Transco's line; Also pipe line superintendent with Brown and Root, Inc., and later as engineer with River Construction Corporation.

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Robert R. Herring, president, Fish Service and Management, Inc. Started in oil and gas business in West Texas and advanced to general manager there. Since joining Fish has personally directed the engineering, design, and construction of many transmission and distribution systems.

—The End

1. Fred Clark, recently promoted to district pipe line foreman for TGT's Louisiana Coastal line, explains operation of a back-pressure operator to Unit II group at East Bernard station.

TGT Training Program Pays Off

First company-wide training program in the gas transmission industry gets nearly 100 percent response. Indications are that benefits will be many.

By DON E. LAMBERT
PIPE LINE INDUSTRY Staff

SUPERVISORS at Tennessee Gas Transmission Company are taking a king-sized bite out of the troublesome problem of building an adequate staff of trained operating personnel who understand:

- The equipment and machines they operate.
- The over-all operations of TGT.
- The full story of gas pipelining.

Through the supervisors' efforts, Tennessee Gas has initiated a gas transmission training course—a pioneer effort to reach *all* of the company's field employes with the complete story of gas, a full picture of pipelining and an over-all look at TGT operations.

This is the first course of its kind to be designed for all operating employes in a pipe line company. In fact,

The TGT training program benefits employes in four ways:

1. It shows each employe where he fits in the company operations, what his fellow employes do and the importance of each job to the company, its customers and gas consumers. By understanding the part each man plays in the operation, all employes will be able to work together as a better team.

2. It helps the employe do a better job on present assignments.

3. It helps the employe become better qualified for promotion.

4. It helps the employe keep abreast of new developments—a must in a fast growing pipe line system.

2. During question and answer period after one of the sessions. The University of Texas' Extension Instructor Curtis Kruse (second from left) explains diagram on relief valve to (left to right) Jimmy Wise, district foreman; R. G. Dobias, utility man, and J. Gregor, pipe line repairman.

this is the first time such a comprehensive program has been offered in the gas pipe line industry.

According to early indications, the program is succeeding even beyond expectations. The training sessions, set up during off duty hours on a strictly voluntary basis, have drawn better than 95 percent attendance at each of the locations where they have been presented.

3. Engineer Fred Clark uses schematic and graphic training aid to describe gas pressure regulator during Unit II sessions at East Bernard.

"This is your program—do you want it?" Initial plans for the program began last year when TGT officials invited 40 supervisors to a special meeting to discuss what to do about the personnel training problem. During that meeting a Supervisors' Steering Committee was formed to establish the transmission training program.

When the plans were drawn up the Steering Committee presented them to the employes with the question: "This is your program—do you want it?" The affirmatives were unanimous.

With this go-ahead, the Steering Committee completed its plans with full cooperation from the TGT Training department and The University of Texas' Extension division, one of the nation's leaders in oil and gas training. The experimental phase of the program was started in Texas early this year.

Mechanics of Program. The "pilot phase" courses (conducted only at five TGT Texas pipe line field loca-

4. Assistant Chief Engineer Ben R. (Cotton) Keller (standing) discusses plans for next session at East Bernard with instructors and advisors. From left to right are Fred Clark, Russell Willoughby, Curtis Kruse, John Watson, Keller, Ernie Phillips, Loy Upp and Roger Wistner.

tions) are being taught by The University of Texas instructors with the aid of TGT personnel. The pilot sessions are also being used to train 24 company employes who will present the course at other locations.

The program is divided into four instruction units, each of which consists of one three-hour session per day for one week, with each session being repeated at a different "off duty" time to allow full participation by shift workers. Stations will receive each unit at 12-week intervals.

With the help of The University of Texas, the company has prepared a complete selection of visual aids for each instruction session. There are films, charts, actual equipment and cutaway models to illustrate nearly every topic. Each session also includes discussion periods so that every employe has a chance to ask questions about parts of the topic he doesn't understand.

Aims of Program. From the start TGT has emphasized that the program is not intended to teach *how* to do any specific job or operation. It is intended solely to broaden the overall knowledge of TGT employes with the following goals in mind:

- To show each transmission employe where he fits in the company's operations, where his fellow employes fit and the importance of each job to the company, its customers and gas consumers. By understanding the part that each man plays, all will be able to work together as a better team.
- Informed employes not only do a better job on present assignments but are better qualified for advancement.
- Operational employes need to keep up with the new developments in the industry. Equipment is getting more and more technical, requiring a higher degree of training (subjects on remote and automatic control are offered in the course).

That these goals are being reached, even at this early stage, is expressed in the reactions of TGT officials. Ed Murray, vice president and general superintendent of transmission operations, describes the progress of the course:

"When we started the training course it was one of hope. Since the sessions were entirely voluntary, if no one attended we would have had to stop right there. I am pleased, not only with the high voluntary attendance, but also with the real on-the-job good the sessions are doing for all the participants."

Plans for Future. If the training program in Texas is a success as now indicated, TGT will make the four instruction units available to 1400 employes working at the company's 25 field locations in nine states outside of Texas. The TGT employes now being trained as instructors will teach the remainder of the sessions without the aid of The University of Texas.

Plans are to repeat the program at 5-year intervals. Reason: Changes in operators, promotions and turnover in personnel will regularly produce new employes who will benefit from the information-packed program.

What TGT's Training Course Covers:

UNIT I

1. Introduction and Orientation.
2. Growth of the Gas Industry.
3. Gas Production (geology, drilling, and mechanics of production).
4. Properties of Natural Gas (chemical composition, contaminants).
5. Physical characteristics of Gas (states and critical data, basic laws, density and specific heat).
6. Combustibility (heat value, influence of composition).
7. Hydrate formation (composition, cause, effect, prevention).
8. Lease Processing.
9. Field gathering systems (source of supply, delivery area, field stations).
10. Plant processing (recovery of liquid hydrocarbons, effect on heating value).
11. Removal of Impurities (materials removed, methods—scrubbers, absorbers, adsorbers and refrigeration).
12. Transmission (pipe line right-of-way, flow calculations).
13. Compressor Stations (spacing, types of compressors, prime movers, station piping).
14. Storage (peak demand load, in-put characteristics and withdrawals).

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UNIT II

1. Controls (valves—types, materials, service ratings and numbering systems; automatic valves—operating principles, applications, tests and maintenance).
2. Regulators (self contained—basic principles, application, maintenance; pilot operated—basic principles, application, maintenance).
3. Thermostats (basic principles, application, maintenance).
4. Meters (positive displacement, principles, applications, tests, maintenance; orifice meters—principles, specifications, application; recording devices).
5. Metering Auxiliaries (calorimeter, gravitometer, dew point apparatus. H_2S tester, supercompressibility tester, odorometers, odorant injectors, pulsameters, gas analyzers).
6. Operational Controls (system balance, communications).
7. Remote Systems (types of telemetering systems—telephone and microwave; types of telemetering equipment—electrical, pneumatic).
8. Gas Accounting (equipment and procedures).

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UNIT III

1. Basic Types of Prime Movers (internal combustion engines, steam driven, electric motors).
2. Station use of Prime Movers (compressor drive, pump operation, power generation, fan drives).
3. Internal Combustion Engines (two cycle—principles, sizes and types, fuel and load characteristics, maintenance; four cycle—principles, sizes and types, fuel and load characteristics, maintenance).
4. Gas Turbines (principles, sizes and types, fuel and load characteristics, maintenance, comparison with piston types).
5. Steam Driven Prime Movers (piston type and turbines).
6. Electric Motors (principles, sizes and types, uses, wiring, ratings, code, maintenance, safety).
7. Reciprocating Compressors (principles, operation cycle, sizes and types, horsepower and delivery, loading and efficiency, lubrication, cooling, maintenance).
8. Centrifugal compressors (principles, operation, sizes and types, horsepower and delivery, loading and efficiency, lubrication, cooling, maintenance).
9. Station Auxiliaries (gas scrubbers, gas coolers, yard piping, electrical systems, engine cooling equipment).

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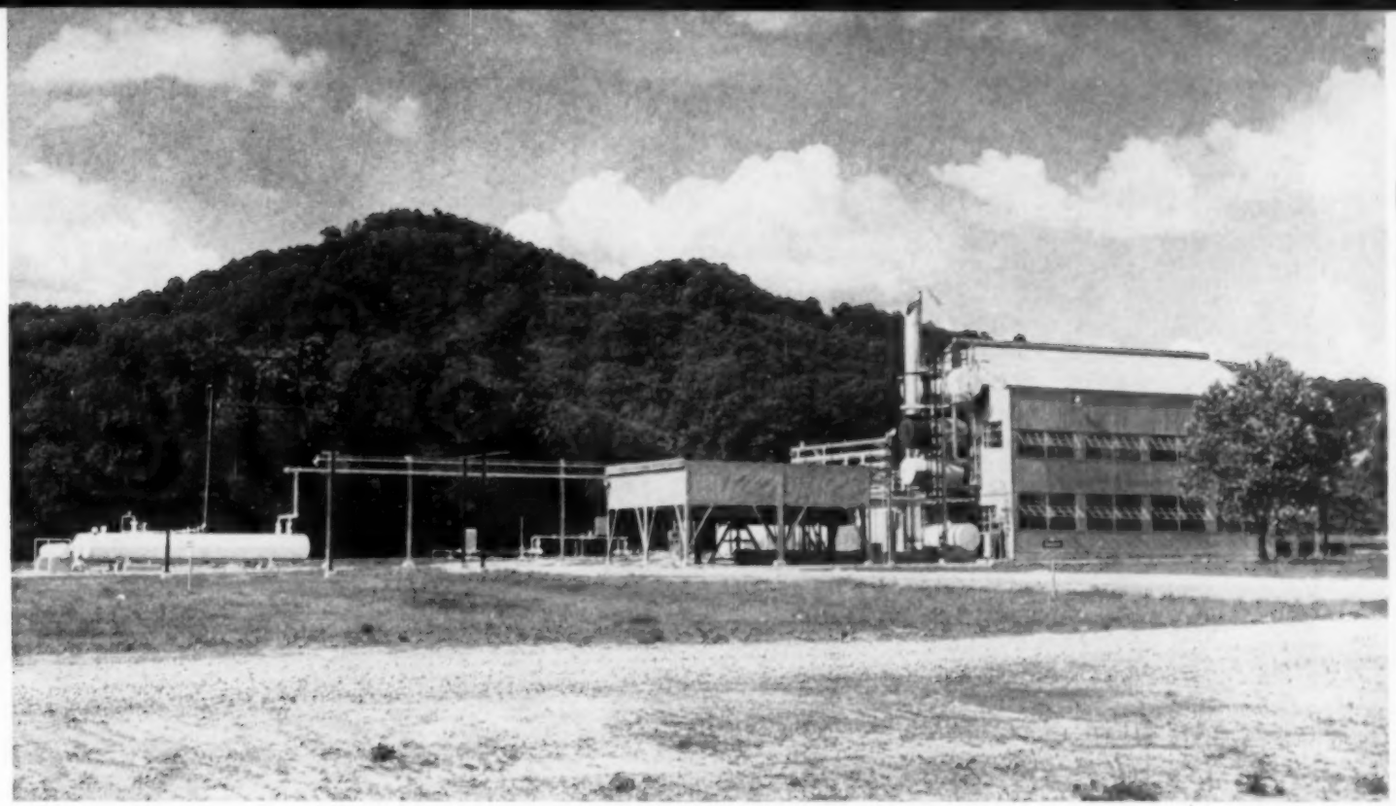
UNIT IV

1. Design Considerations (definitions, codes).
2. Pipe Fittings and Welding (metallurgy, valve types and selection).
3. Construction Materials.
4. Electrical Codes (distribution—service, underground, grounding; National Electrical Code, Article 500).
5. Fundamentals of Corrosion (electron transfer, polarization).
6. Corrosion Factors (environment effects, rates, dissimilar metals, stress corrosion, stray currents).
7. Corrosion Control (use of proper materials, inhibitors, coatings, cathodic protection—theory, source of current, potential and current needs, corrosion surveys).



Gulf Interstate's Stanton, Ky., station (above) has been down only 9½ hours for minor repairs and adjustments since remote start-up. With 2400 hours of efficient, economical and dependable service . . . this satellite station is . . .

Setting a Pattern for Future Stations

Success of this station has increased the confidence in remotely controlled, unattended compressor stations for mainline service.

TOP PERFORMANCE of Gulf Interstate Gas Company's "satellite" station near Stanton, Ky., greatly boosts confidence in use of remotely controlled, unattended compressor stations for gas transmission mainline service. Engineering development and design has been based on Gulf Interstate's two years' earlier experience with five 8000-horsepower semi-automatic stations. Each of the original stations is operated with only one operator per shift per station. Now Gulf Interstate has taken the next logical step to the ultimate goal—unattended operation, controlled remotely from an adjacent station.

Since the Stanton station was built in December, 1955, it has been operated a total of more than 5000 hours, nearly half of which has been unattended. During early tests it was operated locally, both automatically and manually. (see PIPE LINE INDUSTRY, March, 1956, Page 38). On March 27, remote operation started from the Clementsville, Ky., station, 80 miles upstream. The day operator was taken off shift on May 21; the evening shift was secured on June 5; and operation became completely unattended when the last shift operator was discontinued June 16. Actually, the station is still guarded against emergencies by an elaborate warning system which alerts the section superintendent and the station chief mechanic. Both live in company houses on the station grounds.

Since the Stanton station went into operation, it has had no false shutdowns resulting from equipment malfunction. Unplanned shutdowns for only minor repairs and adjustments have amounted to a total of just nine and one-half hours since March 27.

Successful operation has proved the design at Stanton. Increased flexibility in delivery pressures plus the added capacity for increased peak loads for short periods are worthwhile advantages. Peak compressor capacity is over 500 MMcf per day at a discharge pressure of 935 pounds per square inch.

Experience on a 375-MMcf per day rate with the engine producing 3500 hp at 327 revolutions per minute shows the centrifugal compressor to have an 83 percent efficiency factor. Mechanical loss through the compressor is one percent and the gear train has a loss of only 2.5 percent. Gulf Interstate has made a number of performance tests at different operating conditions. All results have been satisfactory by accepted engineering standards, showing that both the engine and compressor operation are up to expectations. On the basis of this success, the FPC authorized Gulf Interstate to make the Stanton station a permanent operating facility a few weeks ago. It is no longer classed as experimental.

What Has Gulf Interstate Learned From Early Operation at Stanton?

Advantages of operating compressor stations from a central dispatching point have been more clearly defined by the first few months of experience of the satellite station. Most important is the estimated 10-15 percent savings in operating cost. More effec-

Operator pushes 'start' button at Clementsville, Ky. At Stanton, 80 miles away, the sequence begins and the 'satellite' station picks up the mainline load. This control and indicating panel contains the 'start' and 'stop' buttons, operating set controls, position indicator lights for Stanton station valves, plus suction, discharge, and starting air pressure instruments.

tive control over line and delivery conditions, plus dependability and proved safety have convinced Gulf Interstate that such stations are a good bet for future expansion. Further improvements and refinements will be made, but Stanton's design will establish the pattern, company officials emphasize. The same principles built into this first experimental station will be applicable to multi-engine stations that may be constructed at intermediate sites on the system.

Equipment Well Fitted to Job. Stanton's power unit is a 16-cylinder, 4-cycle LSV reciprocating engine, rated at 3500 hp. The spark-ignited engine is supercharged and utilizes turbocooling on manifold intake air to achieve somewhat higher power rating with no excessive heat load. Fuel economies are about 6000 Btu per brake horsepower hour. Jacket water is coil cooled by a fan driven by the engine through a fluid coupling. An automatic governor controls fan shaft speed. Water and lube oil pumps, seal and gear oil pumps are driven directly off the main engine.

A two-stage, double helical, separate helix articulated type speed increasor transmits engine power from 360 up to 5500 rpm to the compressor. Engines and gear unit are located in the main engine building. The vertical centrifugal compressor, having a 29-inch impeller and one-half inch diffuser width, is installed on a block just outside the main building.

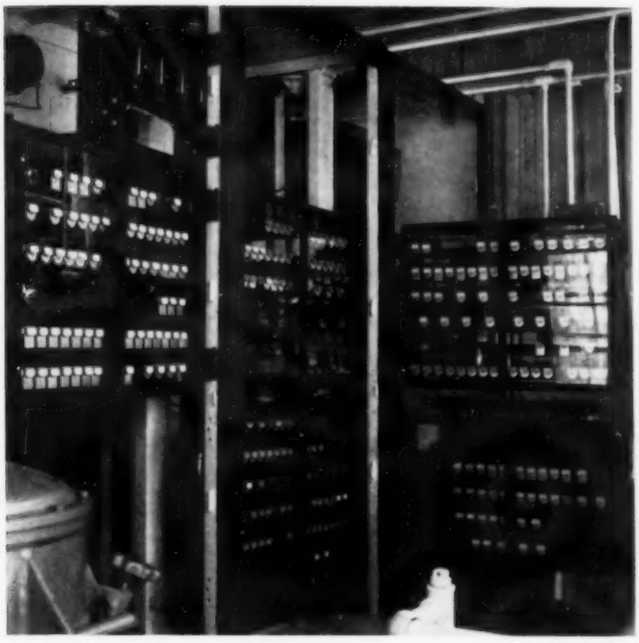
Controls and Recorders Are Station's Nerves. A network of instruments for control and recording enable the operator at Clementsville, 80 miles away, to control all necessary functions at Stanton. Basically, controls have two main functions—normal operational control from the remote station, and automatic alarm or shutdown devices.

Normally, the operator at Clementsville can start the engine, set the discharge pressure control and stop the engine remotely. A bank of 52 automatic safety controls perform one of three functions—sound an alarm, shutdown and subsequent restart, or shutdown and lockout. Alarms give visual or audible warning of a condition which is not sufficiently serious to shut down the engine of the station. Next in order are the shutdown-restart controls which handle conditions serious enough to shut down the engine, but they will permit restart to determine if the fault has been removed. Shutdown-lockout prevents the engine from being started until the serious damage or failure causing the lockout has been corrected. All equipment is designed "fail-safe" so that loss of power or breakdown will give the alarm or shutdown required. Electrical controls and panels are located in the main building annex at Stanton.

Remote Operator Gets Vital Information. To effectively control the "satellite" station the Clementsville operator receives a continuous channel of checkback responses and necessary telemetered data.

- Suction pressure changes of plus or minus 2½ pounds per square inch.
- Discharge pressure changes of plus or minus 2½ psi.
- Starting air pressure changes of plus or minus 2½ psi.
- Engine rpm changes of plus or minus 5 rpm.
- Setting of discharge controller—The setting of the discharge pressure index point can be made either at Stanton or Clementsville, and the location of the set-point is telemetered to Clementsville.

Fire Protection System Is Automatic. The Stanton station is protected in case of fire by three detection instrument. A sensory element, using a photoelectric cell and light rays, sounds an alarm to alert standby personnel. A second device operates on rate of temperature change; a third is a high temperature sensing element. Either of the temperature



Panel relay board at the Stanton station is operating nerve center, translating signals from Clementsville into mechanical control.

Compressor and valving loop installed just outside the Stanton station. Automatic valve operators control the loading and suction gates in response to remote signals.

sensing instruments can shut down the engine, close side gates, vent yard and engine piping, and then turn on a carbon dioxide extinguishing system in the engine building. To back up this system, a gas analyzer continuously samples the atmosphere in danger areas. It will sound an alarm if gas is detected.

Stanton Controls Permit Either Local or Remote Operation. To start the satellite station remotely, the Clementsville operator simply sets the discharge pressure controller at the proper valve, and presses the "start" button. An automatic check is made of all Stanton control equipment and if they are in proper position and working order, startup sequence begins.

First, the compressor is purged through a by-pass around the suction loading gate. The engine starting circuit is energized and all engine auxiliaries go into service automatically. The main engine will not start if all auxiliary equipment is not working properly. After start-up the engine idles briefly, rapidly accelerates through a critical speed range, and the compressor case is brought up to line pressure. To load the engine, the discharge and suction loading gate valves are opened. The engine runs for a brief warm-up period under partial load.

After warm-up the discharge pressure is brought up to the controller setting and the unit is fully loaded and on the line. It then attains and holds the speed requested at the set point. When additional changes in discharge pressure are required, they may be secured by moving the set point to actuate the electronic discharge controller.

To stop the engine from Clementsville the operator simply presses the "stop" button. These functions are performed at Stanton. The main fuel gas valve is closed automatically; the safety fuel valve, line suction and discharge valves are closed; ignition system cuts off to stop engine; and the blowdown valve is opened to vent the compressor. When the engine is stopped, the compressor suction, discharge, and purge valves are closed and the blowdown valve is open.

Automatic Shutdown Devices Safeguard Station. An automatic shutdown system stops the Stanton unit if there is a break in the pipe line; low suction pressure; fire in main or supervisory building; high compressor, engine, gear piping or fan vibration; or in case of low remote control shutdown air pressure. In the event of any of these conditions, the station may not be restarted until the faulty condition is corrected.

Several minor troubles will stop the engine immediately with optional restart to see if the fault has been corrected by itself. These are engine overspeed, low readings for engine oil pressure, gear oil pressure, turbo oil pressure, compressor oil pressure, seal oil level, seal oil drain level, gear oil temperature, and engine oil temperature. The same action will take place in case of high discharge pressure, gear oil pressure, engine oil pressure, engine oil temperature, gear oil temperature, discharge gas temperature, thrust bearing temperature, seal oil drain level, compressor case temperature, starting air temperature, and jacket water temperature.

An alarm sounds but the station keeps operating in case of fire at, or loss of, fuel gas heater; low level in jacket water surge tank; low level in oil cooling water surge tank; low starting air pressure; low instrument air pressure; high centrifuge oil level; gas analyzer leak detection; fire detection equipment failure; high engine oil heater temperature, high gear oil heater temperature; low oil level in engine crankcase or gear case; loss of water pump seals; high differential across seal oil filters; high seal oil level, and seal oil below control level. An alarm also sounds in case of failure of AC, DC, or REA power; gas surge in the compressor; failure of communications; or discharge pressure varying more than five pounds from set point.

In addition to the complete automatic control instrumentation, the Stanton satellite station may also be operated by normal local operation if necessary. —**The End**

Pittsburgh Consolidation Coal Company's 10¾-inch heavy wall coal slurry line gets a coating of asphalt and glass fiber wrap over the ditch. The 108-mile pipe line, laid at a depth of four feet, will deliver 3400 tons of coal a day from the mines in eastern Ohio to the Cleveland Electric Illuminating Company plant at Eastlake, Ohio.

Long Pipe Lines for Solids Nearing Reality

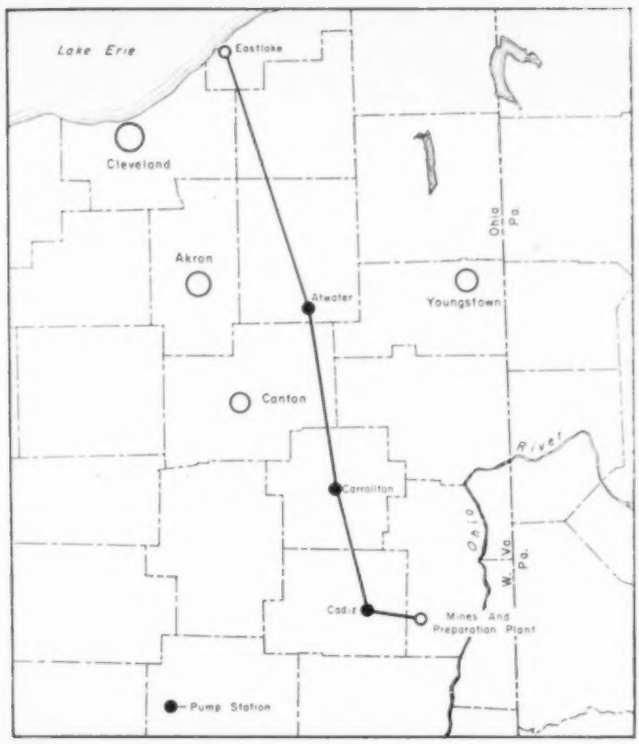
Years of research by Pittsburgh Consolidation Coal Company and American Gilsonite Company should bear fruit in 1957 when both put slurry lines into operation. They promise economical transportation of bulk materials cross-country.

By RICHARD J. TITUS
PIPE LINE INDUSTRY Staff

TWO IMPORTANT developments in pipe line transportation may soon prove that cross-country pipelining of solid materials in suspension is practical and economical. Pilot scale tests have shown that the problems of abrasion and corrosion can be solved.

One project, Pittsburgh Consolidation Coal Company's 108-mile slurry line, is designed to deliver 3400 tons of pulverized coal per day from mines near Cadiz, Ohio, to an Eastlake power plant near Cleveland at about half the cost of present transportation. A second development, American Gilsonite Company's 71-mile slurry line, will move 630 tons of gilsonite ore daily from Bonanza, Utah, mines to a new refinery near Grand Junction, Colo. Both lines are scheduled to be put in operation early in 1957.

Coal pipe lines have been built before. (See PIPE LINE INDUSTRY, July, 1955, page 55.) Earlier lines, however, never exceeded five miles in length and were beset with corrosion-erosion problems. Pitt Consol believes it has beaten these problems through



Right-of-way of 108-mile coal slurry line in eastern Ohio. Operation of Pitt Consol's line early in 1957 promises to halve present coal transportation costs from mines near Cadiz to Eastlake.

Reciprocating pumps such as this one being installed at a station near Atwater, Ohio, will move coal slurry through Pitt Consol's line. Stations near Cadiz, Carrollton, and Atwater, Ohio, will be equipped with three pumps, each driven by a 450 hp motor. Only two pumps will be in operation normally at each station. A third will be on standby for heavy loads.

five years of research. Its test results of a 12-mile pilot line were good enough to justify an $8-10 million outlay to build the 10¾-inch pipe line from eastern Ohio coal mines near Cadiz to the huge Cleveland Electric Illuminating Company plant at Eastlake.

Heavy spring rains slowed construction which began in the fall of 1955 at the southern end of the line. Twenty-nine miles of the line were laid last year before operations were shut down for the winter. The remaining three-quarters of the line will be finished during the current construction season, and actual operation is scheduled for the spring of 1957. The line is being laid at a rate of about 2½ miles a day in good weather.

Pitt Consol's 12-inch pilot loop serves as a model. Pitt Consol climaxed its experiments with the construction and operation of a pilot loop, 17,000 feet in circumference. The experiment utilized 12-inch OD pipe and was devoted to determining optimum pumping pressures and slurry proportions. The study of abrasive action, particularly as it was affected by rate of incline and sharpness of pipe bends, was also given close attention.

The crusher plant for the pilot pipe line included a large hopper nearly 20 feet high, a crusher, and mixing facilities for producing a pumpable slurry.

The actual operating coal crusher at the mines and the three pumping stations near Cadiz, Carrollton, and Atwater, Ohio, are now under construction. Every station will be equipped with three pumps, each driven by a 450 horsepower motor.

Near the crusher site, three storage pits, at least 30 feet deep and 100 feet in diameter have been dug to maintain continuous line operation. Coal will be mined five days a week and the slurry pumped seven days weekly.

At the Cleveland end of the line, the coal can be mechanically and thermally dehydrated and fired immediately.

Pitt Consol's line was designed by Ford, Bacon & Davis of New York City. Williams Brothers Company of Tulsa is the contractor on the line.

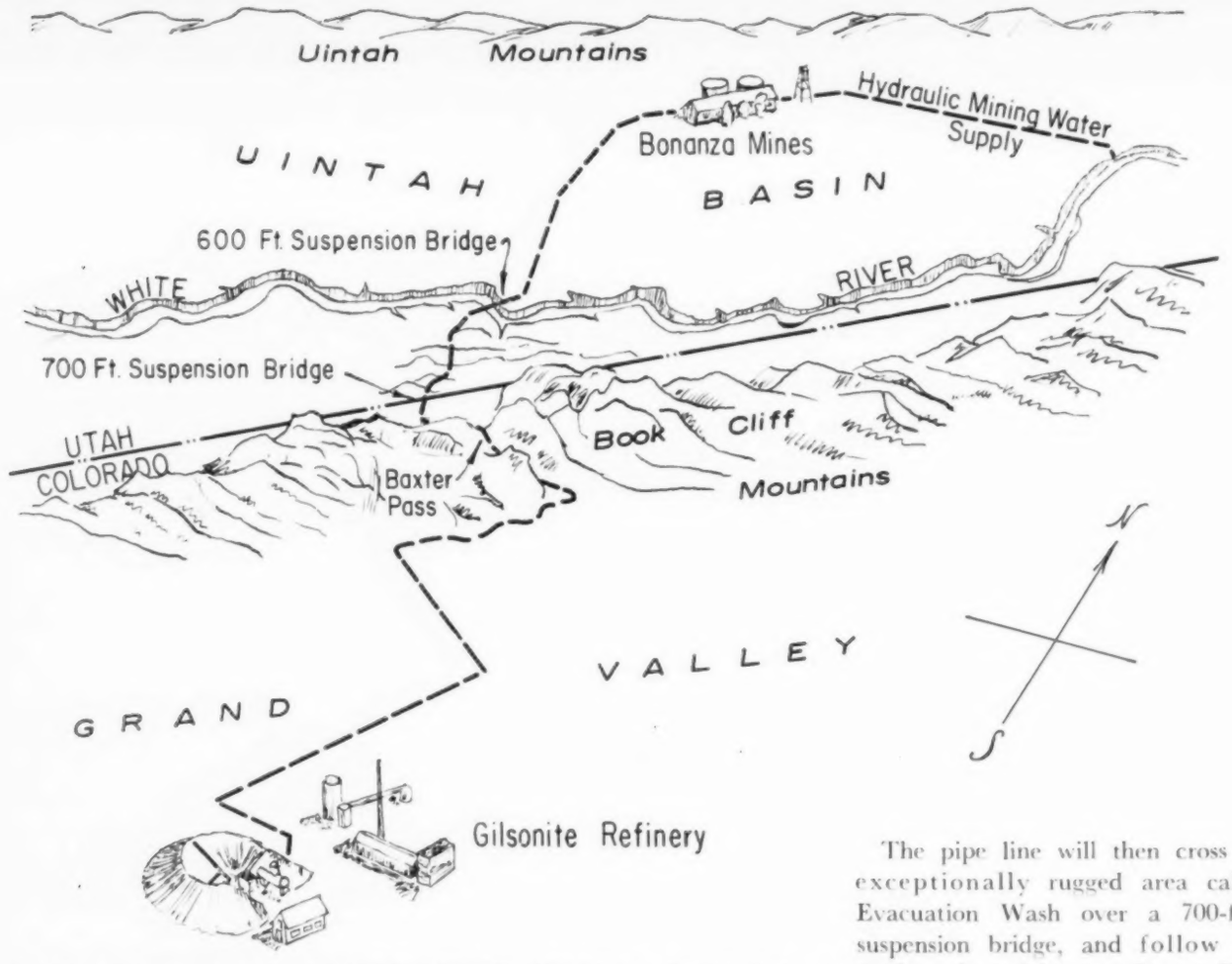
A Pitt Consol official reportedly predicted recently that this line is only the beginning: "This new concept of moving coal to the point of use may be applicable to transmission of larger tonnages over any conceivable distance."

Heavy wall pipe offsets internal abrasion. Designers, in selecting wall thicknesses of 0.375 to 0.687, included abrasion allowance so that the wall thickness is somewhat greater than required for pumping pressure alone. Pipe is being supplied by National Tube Division, United States Steel Corporation, Jones & Laughlin Steel Corporation, Republic Steel Corporation, and The Youngstown Sheet and Tube Company.

The heavy pipe required some modification of normal pipe laying procedure. Stringer bead welds lacked sufficient strength for stove piping this weight of pipe by conventional methods. It was necessary to employ additional side-boom tractors to support the pipe until a second welding pass had been made at the joints.

Inhibitor to control internal corrosion; outside of pipe may be cathodically protected. Coal particles will vary in size from BB-sized pellets down to talcum-like dust. Internal corrosion due to acids produced by solution of sulfur compounds present in coal was a problem during early tests. However, Pitt Consol developed a corrosion inhibitor to add to the slurry and greatly reduce the corrosion rates.

Cathodic protection is being considered. Plans call for operating the line for six months and then surveying the corrosion rate before the decision is made whether to apply protection. Some research on Pitt Consol's experimental loop and considerable ex-



Route of 71-mile gilsonite slurry pipe line from American Gilsonite's mines at Bonanza, Utah, to the processing plant at Grand Junction, Colo. Six-inch line will carry ore in suspension over mountainous terrain. Two 570-hp motor-driven pumps at Bonanza will do the work.

perience with short coal slurry lines in its mines indicate that corrosion will be a function of the erosion rate. It is likely, too, that some cathodic protection will be needed at the pump stations. Pipe is being coated over the ditch with asphalt enamel and glass fiber wrap.

Pittsburgh Consolidation's contract to supply the Cleveland power company with coal reportedly will run for 15 years. The company has immense reserves of coal in Ohio and Pennsylvania which should last for many years beyond the length of the current contract.

GILSONITE TO BE PUMPED TO COLORADO REFINERY

American Gilsonite will pump 630 tons of gilsonite ore daily from its Bonanza mines to its new processing plant near Grand Junction, Colo., through a $2 million pipe line. There the ore will be converted into high purity electrolytic coke for the aluminum industry and high octane gasoline for marketing in western Colorado. Plant output will be 250 tons per day of coke, 1300 bpd of gasoline and 300 bpd of fuel oil.

Principal veins of gilsonite, a naturally occurring solid hydrocarbon, are located in the Uintah Basin of eastern Utah and western Colorado.

Gilsonite line to cross mountainous terrain. American Gilsonite's line will be 6-inch pipe, buried beneath the frost line. The pipe line's route from Bonanza, Utah, to Gilsonite, near Grand Junction, crosses rough, mountainous terrain. A 600-foot suspension bridge will be built over the pipe line's first major obstacle, White River Canyon in Utah. This river will supply water for the mining and pipe line operation from an upstream site.

The pipe line will then cross an exceptionally rugged area called Evacuation Wash over a 700-foot suspension bridge, and follow the wash to its origin near Baxter Pass. The line will cross the pass at an elevation of 8492 feet, following the path taken by the Uintah railroad, abandoned some 20 years ago. From the top of the pass, the right-of-way is all downhill to the refinery site at Gilsonite.

In following the route of the abandoned railroad, the pipe line will be laid on grades that reach 7½ percent in places and around curves once regarded as the sharpest on any railroad.

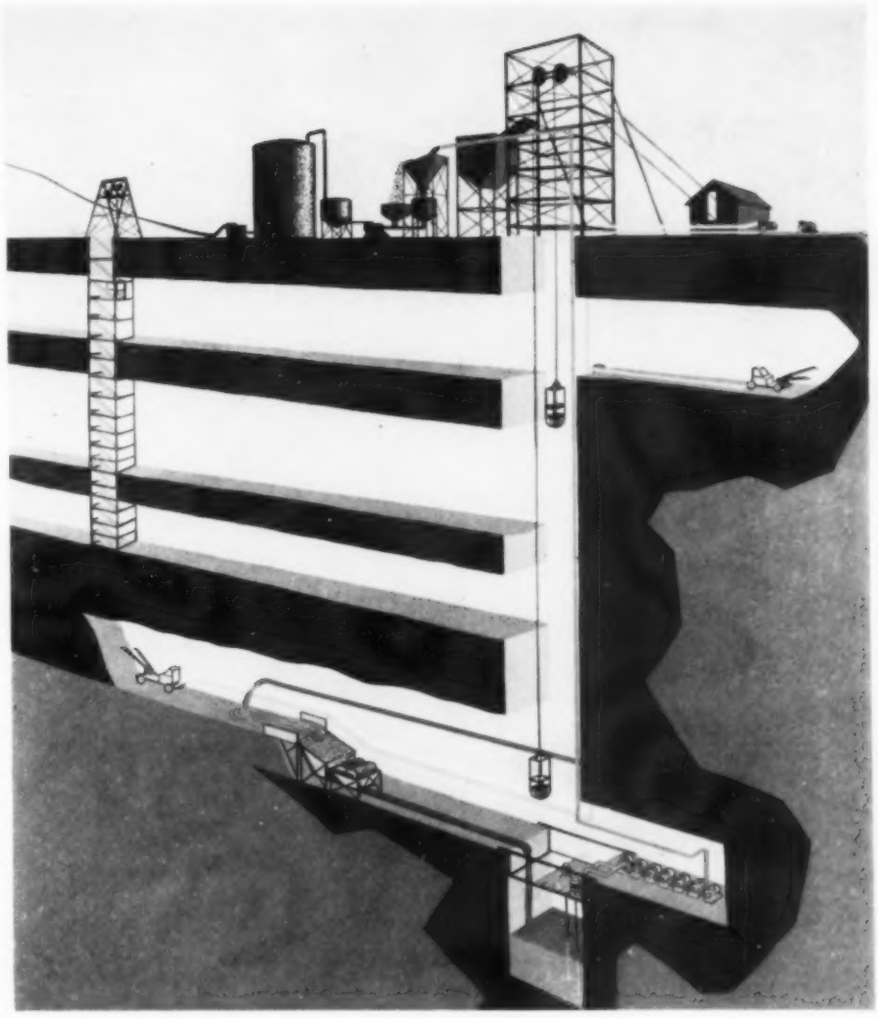
Precautions taken to prevent line plugging. Of three pumps located at the Bonanza station, two will be used for regular operations, and one only for emergencies. Each will be driven by a 570-hp electric motor, but, in the event of power failure, the diesel-engine driven pump that supplies water under pressure for the jet mining operations will be used to push water into the pipe line. In addition, there will be a water reservoir at the top of Baxter Pass to flush the line should flow stop unexpectedly. Pumps

will produce a flow rate of from 200-500 gallons of slurry per minute.

Since precedents for this type of line are rare, many unusual problems arose during its design. For example, will solid material settle out as it goes through the line? And what happens when the line is shut down: will solid material drift to the low places and plug the line? The first situation is avoided by keeping the slurry flowing through the line at a relatively high velocity—2 to 5 feet per second. Also, by maintaining gradual slopes, the probability of plugging the line due to particle settling is minimized. In case of emergency shutdowns, the water reservoir at Baxter Pass insures a complete flushing of the line.

Radioactive test section reveals gilsonite corrosive action. American Gilsonite, like Pitt Consol, built a pilot model to get operating data for a full-scale cross-country line. A radioactive section of pipe was included in the half-mile test line at the Colorado School of Mines Research Foundation, Inc., at Golden, Colo. By measuring the radioactivity of the slurry at the outlet, it was possible to determine accurately the corrosion and erosion rate for the test line. By introducing deoxidants into the line in sufficient quantities to remove the free oxygen from the slurry, corrosion was reduced to acceptable limits.

Since gilsonite is fairly soft, abrasion problems are not as serious as in coal slurry lines.



'Wet' mining methods promise to pay off by decreasing explosion hazards. This cross-section of American Gilsonite's mine shows the course of gilsonite ore before it enters the pipe line that will send it to the refinery. The cut ore is washed to the bottom of the shaft and raised to the surface in buckets. The finer particles are pumped to the surface in a slurry. There the slurry is dewatered and the ore cleaned and recombined with water in proper proportion for pumping through the pipe line.

Explosion hazards reduced by "wet" mining methods. Among the original features of American Gilsonite's pioneering operation will be the introduction of new "wet" mining methods developed over the last four years. Cutting, breaking and transporting the gilsonite by hydraulic means will eliminate explosion hazards from gilsonite dust in confined areas.

Wet ore slurry destined for the refinery is dewatered when it reaches the surface. It is dumped into a bin and then recombined in a tank with a portion of the water which carried it from the bottom of the mine. This slurry is prepared in the proper pumping proportion—between 20 to 60 percent gilsonite—and then cleansed in a process that drops out the sand, rock and other foreign material. Gilsonite is a high purity mineral. Sulfur content is very low and there are only traces of other minerals.

After cleaning, the slurry will be stored in 5000-barrel tanks. Tank agitators will keep the ore suspended. Gilsonite slurry is pumped from these tanks into the pipe line.

The mines, pipe line and refinery represent a $16 million project to American Gilsonite. It is the first privately-financed operation in the country to manufacture petroleum products from other than crude oil or gas raw materials. Initial plans for the project were announced last year, following several years of research and pilot plant development and cooperative work with universities and research institutions throughout the country.

Slurry lines open new horizons to pipe lines. In the past, the coal industry has been dependent on railroads for coal transportation. And, prior to dieselization, railroads were one of the largest consumers of coal. Consequently, the coal operators have not been in position to resist increases in coal-hauling rates. If coal pipe lines are as successful as research would indicate, reduced transportation costs may place them in a stronger competitive position with gas and fuel oils. At the same time, a large reserve of fuel sources may be made available at more economical rates.

Successful operation of the coal and gilsonite lines could well open an entirely new field to the pipeliner—the transmission of bulk solid materials through cross-country pipe lines. It is an interesting possibility that will be closely watched. —**The End**

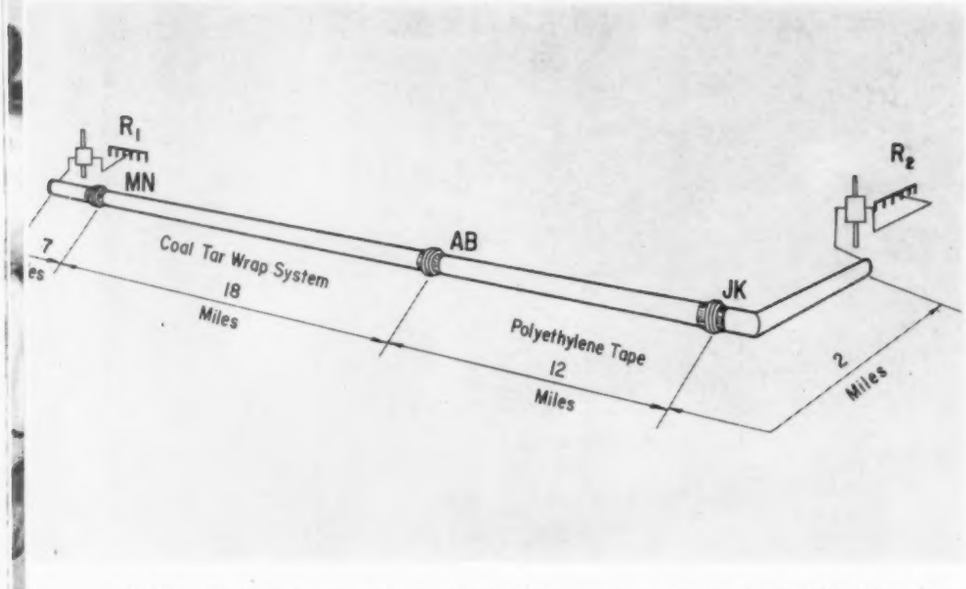


FIGURE 1—Test sections of coal tar and polyethylene tape coatings on Seadrift Pipe Line. Corrosion survey showed a current requirement of only 74 milliamperes for tape section.

Plastic Tape Tests Show Low Current Needs

A 12-mile section of 8-inch gas line cathodically protected by only 74 milliamperes. Experience with polyethylene tape on larger and longer lines to give more answers.

By MARSHALL E. PARKER
Consulting Corrosion Engineer, Houston

FIELD TESTS just completed on the Seadrift Pipe Line in south Texas reveal that buried pipe lines coated with polyethylene tape can be cathodically protected with a current of only 0.0005 milliamperes per square foot. A 12-mile test section of 8-inch line is being protected with a total impressed current of 74 milliamps in 1800 ohm-cm soil.

The test section is located in Refugio and Goliad counties, on the Texas Gulf coastal plain. When the line was built, in February, 1954, this section was set aside for a test of polyethylene tape as pipe coating material. An adjacent section, 18 miles long, similarly was designated for test purposes, being coated with the conventional system used on the remainder of the line.

Insulated joints were installed at each end of both test sections, and bonds placed across them so that the entire line could be protected. These bonds were arranged so that they could be opened for testing. The soils are of same average resistivity—1800 ohm-cm—on both sections, and are quite similar in texture, drainage, and other respects.

Coating on the tape section is a single wrap of oriented polyethylene tape consisting of a polyethylene film of 8 mils with an adhesive mass of 4 mils.

The tape was applied directly to the machine-cleaned pipe, with an overlap of ½-inch, and was covered with an unbonded outer wrap of coal tar saturated asbestos felt.

Both sections tested in same manner. In September, 1955, a cathodic protection system was installed on the complete pipe line including the two test sections. A number of rectifiers are used, two of which, designated as R_1 and R_2, are shown in Figure 1. In March, 1956, the response of the sections to cathodic protection was tested.

First, the bond J-K was opened, and several hours were allowed to pass to permit stabilization of potentials. It then was found that the polyethylene tape coated section B-J was protected adequately by the current from rectifier R_1 alone. The pipe-to-soil potential (referred to a saturated copper-copper sulfate electrode) ranged from a maximum of 966 millivolts at B to a minimum of 888 at J, with a mean value of 936 millivolts.

This potential, achieved with a total current drainage to the section of 74 milliamperes, indicated a current demand of only 6.16 milliamperes per mile.

The bond A-B then was opened, and after stabilization it was found that the conventionally coated 18-mile section, N-A, had a maximum pipe-to-soil potential of 1263 millivolts (at N) and a minimum of 1042 (at A), with a mean value of 1158 millivolts. This was being produced by a current of 564 milliamperes, measured with an ammeter at the bond M-N. Total drainage was 31.33 milliamperes per mile.

This, of course, is a higher potential than was found on the tape section. Reducing it to the same mean potential gives a comparative value of 18.82 milliamperes per mile.

Economics and performance must be weighed in coating selection. The currently accepted best practice for a buried pipe line is the combination of good coating plus cathodic protection. In the absence of interference problems, the most economical program for a line is that for which total annual cost of coating plus cathodic protection is a minimum.

When interference conditions are present, as in congested areas, the excellence of the coating, as judged by its current requirements, becomes even more important. When two coating systems are comparable in total applied costs, the best basis of comparison is by current requirements.

If there is an appreciable difference in both quality and cost, then it is the job of the pipe line corrosion engineer to determine if advantages of greater

freedom from interference problems, flexibility in design, and less dependence upon power availability can justify the added cost of a more expensive coating system.

What about the future for tape? The polyethylene tape used on the Seadrift line was applied by a manually-operated wrapping machine, originally designed for use on short sections of line. There are now available, for all sizes of pipe up to 36-inch power-driven machines for the simultaneous application of the tape and outer wrap, capable of speeds up to 3000 feet per hour.

Use of such equipment brings the total applied cost of the polyethylene tape with outer wrap comparable to that of conventional hot-applied enamels. The material can be applied successfully at all temperatures at which outdoor work can be done. It has been done at 20° below, and the upper limit is above human endurance—perhaps 180°.

The remaining question—one to which no absolute answer can be given at present—is that of ultimate service life of the tape. The line in question is over two years old; the oldest buried piping with polyethylene tape is but seven or eight years old. The material itself is little older.

The early lines are mostly short sections, not isolated from other structures. They have not been the subject of specific tests, so it can be reported only that the coating has not failed.

All other inferences as to the life of polyethylene must be based on its known extreme inertness and stability in a wide variety of environments. These properties make it highly unlikely that it will encounter, even in the complex environment of the soil, any chemical agency which can attack it.

Mechanical damage can increase current demands. It is, of course, subject to mechanical damage, and will undoubtedly sustain some punctures and breaks from contacts and from pipe movement. Since the material is tough and elastic, these breaks will not propagate. A puncture, either from a blow or from pressure, should not enlarge nor generate a crack. Such breaks will constitute a number of small areas of bare pipe, which will cause a certain additional load on the cathodic protection system. A total bare area, from such causes, of an additional square foot (which would mean hundreds of small punctures) would only increase the current demand for cathodic protection by a few milliamperes.

The test section here described, as well as others, has led to an increasing acceptance of the material in the pipe line industry. Recently a 10-mile section of American Louisiana Pipe Line Company's 30-inch gas transmission line, in eastern Tennesee, was wrapped with this tape. The equipment easily kept pace with other operations on the spread.

This success on the 10-mile section has led to a contract for the application of the same material to 122 miles of 22-inch for the same company, on the line between Defiance, Ohio, and Bridgman, Michigan, scheduled for construction in August.

The End

FIGURE 2—Polyethylene tape and glass fiber outer wrap goes on 10-mile section of American-Louisiana's 30-inch line. Plans call for application of tape to 122 miles of 22-inch also.

About the Author

MARSHALL PARKER has been active in pipe line corrosion studies and has written many articles on the subject for technical publications. He is a registered professional engineer in Texas and has been a consultant on pipe line corrosion problems since 1950. Much of his time and efforts have been devoted to technical committee and short course activities of the National Association of Corrosion Engineers. Parker holds degrees from Sam Houston State College and Rice Institute.

FIGURE 1—Service Pipe Line's Big Muddy booster station is typical of design layout. Switchgear and controls which receive and transmit telemetered operating signals from remote parent station are installed in cubicles. All arcing gear is located 75 feet from nearest crude line.

For Service Pipe Line Company . . .

Midget Booster Stations Are Doing a Big Job

Four unattended Wyoming units prove to be an economical and practical way to increase crude trunk-line capacity. An added bonus—they may be readily shifted to another location if needed.

By LOWELL E. ANDERSON
Service Pipe Line Company
Casper, Wyoming

THE OLD SAYING, "Don't send a boy to do a man's work," has been revised in the four modern booster stations on Service Pipe Line Company's crude pipe line system in Wyoming. These stations may be small physically—an entire station is enclosed in a fenced area only 95 by 125 feet—but in that area there is a lot of pumping wallop. Each has a 1250-horsepower electric motor driven centrifugal pump unit to boost the pressure on a flow of 3000 barrels per hour.

Need for the stations arose from the additional capacity demanded by Service's new Ft. Laramie, Wyoming-Freeman, Missouri, pipe line after it was put in service in 1955.

Engineering planning began on the four stations in April, 1955, and the first one was placed on the line in September. Only five months time was taken for design, ordering and delivery of materials and actual construction.

Stations are located new Owl Creek, Big Muddy, Horseshoe, and Wendover, Wyoming. They are spaced along the Wyoming trunk line eastward from central Wyomnig as shown in Figure 2.

These booster stations are of advanced design using many of the new ideas in pipe line automation. Completely unattended, they could be classified as "remotely-activated, self-controlling." They are started remotely and stopped from a parent station some distance away, but once on stream, each booster station controls its own operation. It is guarded locally by a number of protective devices that will shut the station down should a malfunction occur.

Since these units are boosters, it was possible to design a simple piping arrangement; basically a piping run-around as shown in Figure 3.

It is interesting to note the changes brought about by automatic control devices. A sort of cycle has occurred in pipe line design. On original pipe line systems built around World War I, standard design practice called for a station every 35 to 50 miles. Then during the World War II era when large diameter pipe came into its own, design practice changed so that stations were built about every 85 to 100 miles.

Now, with present day design and equipment permitting completely automatic operation, closer station spacing is again an economical alternate to laying pipe for additional capacity.

A study of the economics for increased throughput on Service's on Wyoming line showed that the most

attractive plan was the building of intermediate stations at spacings which only ten years ago would have been considered obsolete practice.

Remote locations called for building roads, power lines. In line with the changing economics of pipelining, it is necessary to assign a new sense of values to various factors entering into the selection of a site for a proposed pump station. For example, at one time after working out the hydraulics on a proposed system, the station could be located at the hydraulic center, plus or minus a few miles. However, today, when looking at stations that may be only 20 miles apart, the plus or minus tolerance must be reduced considerably. Instead of a few miles, the allowable leeway may narrow down to less than one mile. So hydraulic calculations pin down the station location to almost an exact spot.

Of course, chances of this hydraulic location falling adjacent to a highway are somewhat remote, especially in Wyoming where main roads are encountered infrequently. This was the case when the locations for Service's station sites were selected. Only one of the four locations, Wendover, was adjacent to a road, so for the other three, roads had to be built.

These three station locations all fell in the middle of large pastures so construction crews built graded roads complete with gravelled surfaces, metal culverts and cattle guards. Length of each of these three access roads averaged approximtaely one mile.

Although roads were remote, power lines were reasonably accessible. Wyoming is criss-crossed by numerous large capacity power lines served by the many power generating plants throughout the state. Even with power facilities available, it was still necessary to build feeder lines to each of the four locations, with distances varying from one-fourth up to seven miles.

Station design covered wide range of operating variables. Wyoming is faced with pipe line conditions that are often extreme. They are the most variable but also the most interesting of any on the Service system which takes in the entire Mid-Continent area.

To begin with, crude characteristics range from 17° API black sour oil with a winter viscosity of 5000 SSU (the equivalent of SAE 20 motor oil) to light sweet crudes with a summer gravity of 46° API and a viscosity of 35 SSU (roughly equivalent to kerosine). Low atmospheric temperatures drop winter crude stream temperatures well below freezing.

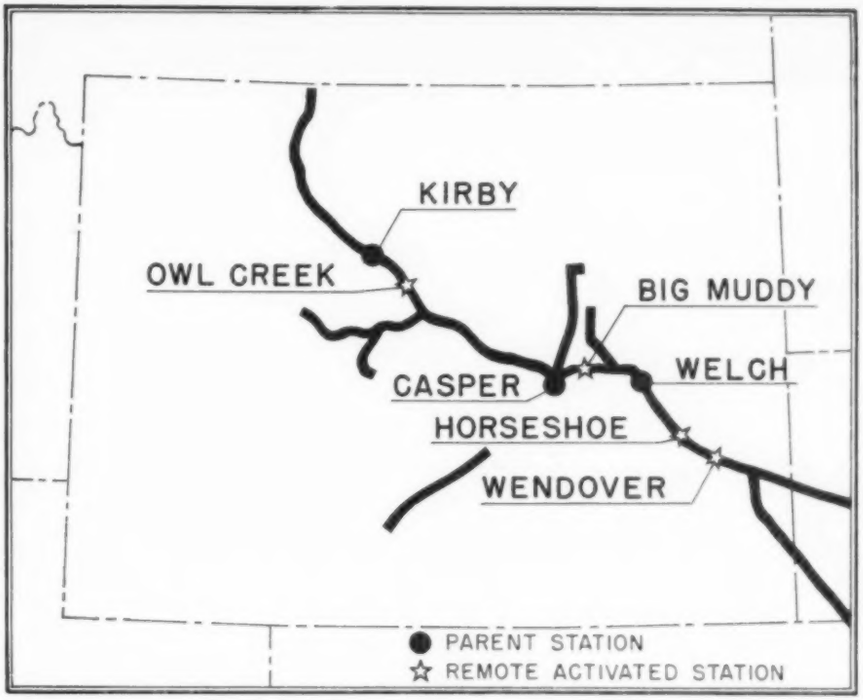


FIGURE 2—Four new booster stations on Service's Wyoming trunkline increase delivery capacity to Fort Laramie-Freeman, Mo., line. Each 1250-horsepower, electric-centrifugal booster is controlled remotely from parent upstream.

About the Author

LOWELL E. ANDERSON, division chief engineer for Service Pipe Line Company at Casper, Wyo., headquarters for the company's Wyoming division, has been with Service since 1947, joining them a year after graduation from the University of Nebraska College of Engineering. His first five years were spent in the Engineering department at the company's office in Tulsa. Since 1953 he has held various field assignments, working in the West Texas division and later as project engineer on the company's Ft. Laramie-Freeman project. He has held the present position since March, 1955.

Another important factor affecting design work is the great differences in elevation often encountered. In one section of line, the ground elevation rises rapidly from 4200 feet to 6300 feet in a distance of 36 miles. Then, almost as rapidly, the elevation drops to 5500 feet at the next pump station. All of these factors affect both line design and station design.

Pumping equipment must be selected to withstand the high pressure encountered, and motors must be matched to handle the higher loads brought about by decreased efficiency when handling viscous crude oils. All instrumentation and equipment must be made to function under the extremes of temperature and crude oil characteristics that could cause malfunctioning if proper provisions were not made.

All the stations, with the exception of Owl Creek, have two-stage, 3560 rpm, centrifugal pumps driven by 1250-hp weatherproof induction motors. At present these pumps are not impellered for full line pressure so they in effect "float on the line," varying suction and discharge pressures. Local pneumatic control systems at each station automatically position a diaphragm control valve to maintain the suction pressure above a min-

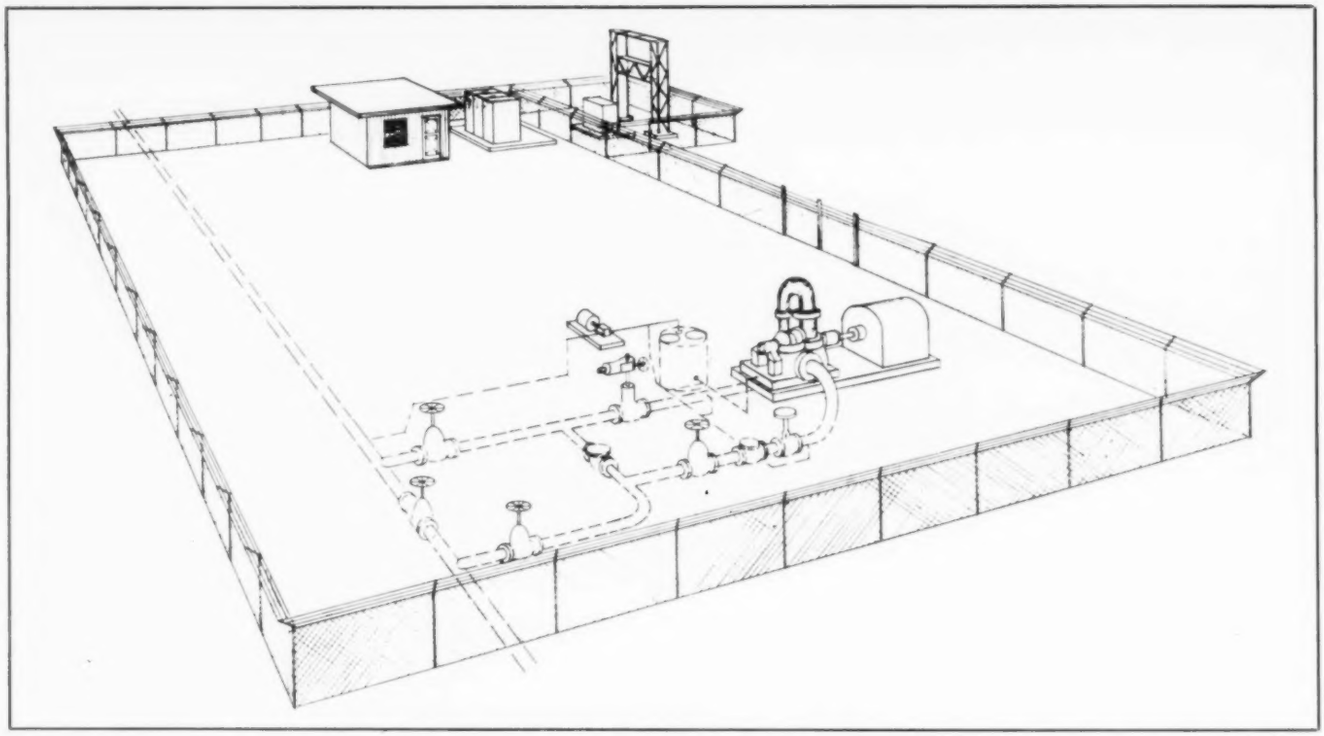


FIGURE 3—Station piping system is greatly simplified. It is basically a piping run-around with valves and controls designed for outdoor winter operation.

imum of 50 psi and the discharge pressure below the pressure limit of the pipe.

Control devices protect units from possible troubles. Shutdown mercury switches are provided at each station for each of the following hydraulic and mechanical conditions:

1. High discharge pressure
2. High case pressure
3. Low suction pressure
4. High case temperature
5. High motor inboard bearing temperature
6. High motor outboard bearing temperature
7. Low motor lube oil pressure
8. Low instrument air pressure

Other protective shutdown devices are provided for:

1. High sump level (capacitance probe type).
2. Excessive vibration (activated when excessive vibration occurs on pump unit due to bearing failure, impeller failure or single phasing of motor)
3. Mechanical seal failure (capacitance probe type).

The switchgear provided is completely weatherproof, outdoor type, and consists of three cubicles: A main station circuit breaker cubicle, motor control cubicle and auxiliary cubicle. The main station breaker and the motor circuit breaker are identical air circuit breakers with a capacity of 1200 amperes. The following relays are provided for shutting down the station:

1. Motor overload
2. Reverse phase
3. Current balance
4. Low trip voltage
5. High motor winding temperature
6. Undervoltage

Telemetered signals control stations from parent station by phone line. Stations are started and stopped remotely from a parent station by means of a control system telemetered over the company's phone lines. This is the extent of the parent station's control. Once the booster station is on the line, it controls its operating conditions within the pressure limits specified and protects itself against damage by means of the many protective devices.

However, the parent station receives continuously telemetered data on suction pressure, case pressure, discharge pressure and flow rate from the intermediate station.

Bugs have been worked out with little operating difficulty. With any new type of equipment and new method of operating, there are certain bugs that have to be worked out. These stations were no exception. First problems centered on the pneumatic control system, learning its characteristics and limitations.

Primary part of the control system consists of transmitters that convert crude oil pressure to 3-15 psi air pressure. Transmitters are mounted in a cabinet in the station yard near the pump unit as shown in Figure 4. This was done to keep all crude oil lines at least 75 feet from arcing contacts, the area where switchgear and telemetering equipment is located.

With the coming of cold weather trouble was encountered with ice in the transmitters forming from moisture in the air. The moisture problem was partially solved by increasing the length of the heating cycle in the air drier. Large immersion heaters have been ordered to further improve drying of the air.

To safeguard further against low temperatures, the transmitter cabinet was insulated on all interior walls by use of a two-inch thick glass fiber insulation material held in place by #10 expanded metal welded to the interior panels. Explosion-proof heaters also were installed inside the cabinet.

Another source of trouble occurred during a particularly cold siege of weather. In trying to start the stations, it was discovered that the station

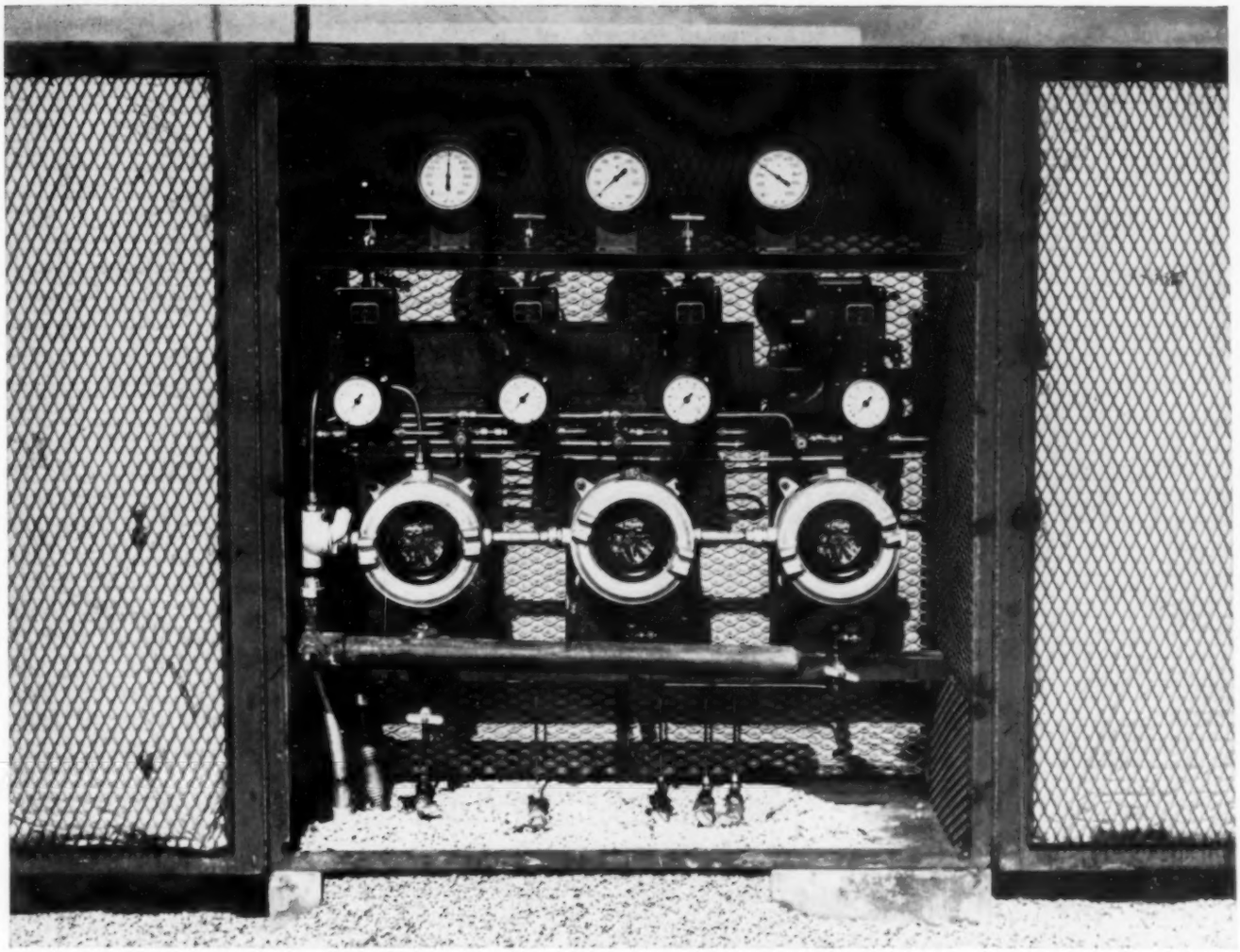


FIGURE 4—Wyoming's cold winter weather caused several 'bugs' to crop up in the control systems. Pressure shutdown switches and transmitters that convert crude oil pressure to air pressure are now protected by 2-inch mat of glass fiber insulation and explosion proof space heaters. Electric thermal elements were installed on several critical control lines. Cold weather problems have been whipped.

would not stay on the line and would keep shutting down due to low suction pressure. In trouble-shooting this malfunction, it was apparent that actual crude oil pressures were not being transmitted properly to the pneumatic transmitters. Cause of this was found to be in the crude oil lead lines which were full of waxy crude that had congealed due to the cold weather. They were not transmitting pressures from the crude line to the transmitter properly. This problem was solved by filling all lead lines with diesel fuel.

Cold weather and congealed crude oil showed up as trouble in another form later when one of the pumping units was shut down by the mechanical seal failure probe. Upon investigation, the drain line from the mechanical seal to the sump was found to be plugged with the waxy crude. The seals leak a small amount of oil continuously for lubrication and because this oil was moving through the drain line at such a low flow rate, it gradually had plugged the pipe.

To prevent this from re-occurring, all exposed drain lines were wound with thermostatically-controlled heating cable and the entire assembly insulated with pipe-formed asbestos.

Latest source of trouble was found in the electrical switchgear when difficulty was encountered with the stations going down due to low trip battery voltage. Switchgear contains a 48 volt DC battery for operating the relays and tripping coil, the battery being kept at full voltage by a trickle charger. It has been difficult to maintain proper charge on the batteries due to a manual charger being furnished—the batteries are either undercharged or boiling off water due to overcharging. Voltage sensitive relays are being obtained to maintain these batteries at their prescribed 48 volts.

Training of personnel for automatic operation pays off. Concurrent with installation of these new stations, operating personnel on the system were orientated with new type equipment. This was especially true of personnel at the parent station who have to understand the telemeter readings they receive to evaluate operating conditions at the remote stations properly.

Over-all, experience with the stations has been very satisfactory. Type of facility is an economical, practical means of obtaining an increase in pipe line capacity.

Another important factor is the high salvage value of all equipment comprising these booster stations. If it develops they are no longer needed in their present location, they can be dismantled easily and moved to another location where an increase in pipe line capacity might be needed.

—**The End**

El Paso spreads cross the San Juan river in northern New Mexico. Pipe was first laid to the edge of the main channel. Then an earthen dam was built upstream. Water flow shifted over the section of line near the far bank and the 800-foot crossing was completed.

At the San Juan, El Paso spreads found . . .

One Good Way to Cross a River—Move It

First the 34-inch line was laid across the dry bed. Then bulldozers built a dam to divert the river and the crossing under the main channel was completed by dry land methods.

By FRANK J. MANGAN
El Paso Natural Gas Company
El Paso, Texas

PIPE LINE construction engineers inevitably are faced with the decision to go under or over at every river crossing. Of course, every answer depends upon the particular conditions met. Wide streams are always a real problem, but whenever possible along El Paso Natural Gas Company's lines in the Southwest, the less expensive submerged crossing is made.

At the San Juan river crossing near Bloomfield, N. M., however, construction men came up with a novel solution—shift the river bed and lay the crossing by dry land methods.

The 34-inch pipe line was laid up to the edge of the main channel first. Bulldozers then built a dam upstream and diverted the river to flow over the recently-constructed line. After the flow was shifted, the line was laid under the main channel.

This submerged crossing marked the first phase of a large-scale construction program which is carrying El Paso's pipe line spreads 193 miles west from the San Juan Basin across the Navajo Indian Reservation. Contractors will build the line on to the California border. The entire expansion project is to cost $195 million and will boost deliveries an additional 450 million cubic feet of gas per day to El Paso's Southwestern and West Coast customers.

Aside from the discomforts of working knee deep in seepage water from the San Juan river, which was diverted for the job, the submerged crossing went through without a hitch.

Approach laid first, then dam diverted river. Pipe was laid up to the water's edge first. Next, a dike was constructed to divert the river from its main channel. An earthen dam was thrown up across the stream, which caused the water to back up slightly and begin flowing over the area where the first part of the pipe line already had been laid.

As soon as the river changed course, crews moved in with ditchers and began working rapidly across the now

First section of 34-inch pipe being readied for lowering-in across the dry part of the river bed. Coating is protected with a 3/16-inch shield of asphalt-impregnated felt.

Bulldozers move material from dry river bed to build dam upstream from crossing site. Channel was shifted and 34-inch pipe laid across the deepest part of river bed.

muddy river bed, opening the ditch to an average of 20 feet in depth.

Biggest problem met on the crossing was the existence of a thick layer of tough blue shale hidden under the sand and gravel of the river bed. This solid rock had to be drilled and shot with explosives to carve out a pipe trench deep enough to make the crossing safe.

Clamps every 40 feet anchor pipe in shale. Then the yard-coated pipe was welded, wrapped with rock shield (an asphalt base felt sheet 3/16-inch thick) and lowered into the ditch. It was anchored firmly with tie-down clamps bolted nine feet deep in the shale to help overcome the buoyancy of the pipe. Anchors were installed every 40 feet. The pipe then was covered with river sand and large boulders to hold it down when the water began flowing back over it.

Pipe used in crossing directly under the river was .750-inch wall; for the approaches, .500-inch wall pipe was adequate.

In all, 800 feet of 34-inch pipe was used to cross the San Juan and its approaches. Simultaneously with the laying of the large-diameter line, El Paso Natural's crews crossed the river with an 8-inch products line on the same right-of-way. This products line will run 96 miles from El Paso's Blanco gasoline plant near Farmington to Wingate fractionating plant near Gallup. Construction work is scheduled for completion in November.

—The End

Driller makes shot holes for blasting thick layer of blue shale under the main channel. After pipe was laid, anchors were installed every 40 feet in the shale to hold down 34-inch pipe.

Youngstown's "big 5"

MEAN ELECTRIC WELD LINE PIPE PROVEN AND READY FOR OIL AND GAS PRODUCING AREAS

Here are the "Big 5" reasons why Youngstown Electric Weld Line Pipe is your best buy:

1. It bends readily
2. Wall thickness is uniform
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4. Weldability is outstanding
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In the process of producing Youngstown Electric Weld Line Pipe, every means is explored to assure uniform wall thickness. Uniformity of wall in the pipe begins with control of the skelp thickness produced on the rolling mill. The experience plus control in the rolling of the skelp by men who know steel makes this uniformity possible. Youngstown as an integrated producer has full control over the skelp rolling as well as the finished pipe production. To test the uniformity and quality, the pipe is then placed in a hydrostatic testing machine where internal pressure is applied. To obtain Electric Weld line pipe of uniform wall thickness—specify Youngstown Electric Weld line pipe for your next pipe line job.

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Crews of men, equipped with tow-ropes, provided the power to move the five tanks through canals constructed specifically for this purpose.

Shell Frogmen Speed Shift of Storage Tanks

Five storage tanks at Cheshire, England, tank farm were floated to new locations in flooded canals. Divers kept lines clear and spotted tanks on new bases.

CONSTRUCTION OF pipe lines and tank farms calls for men with a variety of abilities but the work of "frogmen" on a storage tank relocation project at Shell's Stanlow tank farm near Cheshire, England, was a novel approach that paid off. Swimmers moved through the shallow flood waters to keep towlines free from snags and then guided the five floating tanks to new foundations.

These tanks were part of a ten-tank relocation project, necessary for expansion of refinery facilities. The 70,000-barrel storage tanks had to be moved 500 to 1300 yards from their existing positions. Each tank was 118 feet in diameter and 40 feet high.

Three different moving methods were used. The first four tanks were skidded on rail tracks from their original positions to the new foundations by diesel truck. One distant tank was cut into sections and re-erected by welding it on its new foundation 1300 yards away. The remaining five were floated to their new locations along a specially built canal.

The canal, connecting the old and new tank compounds, was approximately 50 yards wide and 500 yards long. To fill it, 24 million gallons of water was pumped from the Gowy river, which flows through the refinery area. The operation had to be timed to coincide with tides in the Mersey river estuary to make sure enough water would be available.

The canal and tank compounds were flooded to an average depth of 3½ feet, sufficient to buoy the tanks which had a draft of about two feet. Men moved the tanks with tow ropes while tractors stood by to control the tanks in case of high winds.

Men stationed on the top of each tank dropped steel-pipe anchors when the frogmen signaled that the tanks were directly over their new foundations. After each tank was positioned accurately, the seacock was opened, draining the canal and allowing the tanks to sink onto their new base. They were then secured and the flood walls demolished. —**The End**

Five storage tanks are floated to new positions at Shell's Stanlow tank farm in Cheshire, England. Frogmen guided operations by freeing snagged lines and directing the positioning of tanks from underwater at the new sites.

Engineers in Management — Today and Tomorrow

The fast-growing trend to train young engineers for management has created two major problems for industry: How do you determine whether a young engineer has executive qualities; then, how do you develop these qualities after you have found them?

By DAVID F. TVER
Anderson-Prichard Oil Corporation
Oklahoma City

ENGINEERS ARE more keenly aware of their place on the management team than is generally realized.

Proof of this statement can be found in most of the professional and technical magazines. In nearly every issue there is at least one article pointing up the need for engineers in management—pro and con debates on whether engineers are qualified for top management—or ways to transform engineers into executives.

Dig to the roots of these discussions and you will find they all boil down to a few basic facts—the engineers of 1956:

- Have recognized for quite a while their need for management training.
- Resent the often implied view that they are solely technicians.
- Strive constantly for greater participation in management.
- Are convinced of the need for applying both their scientific training and constructive creative mental approach to the general management field.

Engineers' Status. However, there is still some diversified thinking as to the relative status of the engineer and the assignment of his duties and responsibilities.

On one side we see that some companies are elevating the engineer to executive and administrative positions. He has been delegated more and more management authority along with technical responsibilities. He has and is being sent to many specialized conference training courses on executive development, to develop him into an all-around administrative executive. He has been allowed greater participation in management committees, especially those dealing with management problems. Experiences of some companies have shown that as engineering duties expand they require more and broader management decisions.

On the other hand there are those who feel that in some instances generalized thinking of this type can do a company more harm than good, that through promotion excellent engineering talent can be lost. For instance, if an engineer is promoted it is primarily because management wishes to make use of his talents and experiences in guiding a particular group or department. The additional pay is an incidental reward for the heavier responsibilties. If he has a certain talent for design or producing engineering, then by his promotion, management has lost the company an excellent engineer by taking his full drive away from his best area of accomplishment.

Many studies have been conducted over the years concerning man's innate abilities. Significant facts have been learned concerning intelligence, aptitude and interest of individuals. Through the study of thousands of tests over many years, it is now becoming clearer just what are the proper aptitudes characteristic of say a salesman, executive or engineer. It has also become more clear that personal happiness and contentment with one's work depend upon the use of one's aptitudes and that the aptitude to work in other than the indicated field will cause permanent dissatisfaction and a discontented life.

Let us stop a moment and examine just what is meant by aptitude. The psychologist has learned there are wide differences in abilities of individuals. Some people are fast, others are slow in movement and mind. There are individual differences in muscular control as there are differences when mental factors enter into performance, reasoning and creative thinking. These differences between individuals cannot be eliminated by practice or training. The person who was quick at the start is apt to improve more than the one who was slow at the start. The engineer who takes quickly to the job is more likely to be best after a year, unless he becomes self-satisfied and lets himself slump. Practice helps people improve, but it does not shift the normal distribution of aptitudes greatly.

Researchers have found this is also true in the determination of types of personaliites. There are those who can work well with others and can develop into satisfactory leaders or executives, and there are others who work best by themselves or in small groups, and in attempting to leave this group and assume broad executive respon-

sibilities become uncomfortable and unable to adjust to the new position and its demands. No amount of training or study can make a good administrator out of a reclusive person; it can only make him less bad. However, it should be pointed out that the majority of individuals are somewhere between the extremes of these two types and have a certain degree of adjustability.

Knowing this, we should next examine the aptitudes and personality requirements for engineers as determined by the many studies conducted by consulting firms, colleges, universities and industry itself. We should then study the requirements of a successful executive to obtain a comparative picture.

To begin with, an engineer must have an aptitude for "structural visualization" or the ability to visualize objects in their spatial relations. He must also have an aptitude known as "creative imagination," that is, the ability to obtain creative ideas quickly. In addition, he must have a certain aptitude toward mathematics, and certain reasoning aptitudes so that he may be able to think logically, objectively and quantitatively in dealing with these visualized problems.

Equally as important to a good engineer is that he has a subjective personality; that is, he prefers to work by himself, though he may be part of a large working group, who has his own ideas on how a job should be accomplished or what innovations should be tried; who can rapidly think up solutions or means to solutions to problems and try them out himself. While he is pleasant to get along with and generally a sociable person, he is always happiest working by himself, doing his own creating and testing of his creations. To him, salary is not as important as individual freedom of accomplishment.

Must Know People. Some of these thoughts are expressed by Carl E. Reistle, Jr., and W. C. Eldridge. Eldridge of Booz, Allen and Hamilton, has pointed out some of the 'flat sides' frequently found in engineers as a group.

Probably most important, he said, with their training in logic and high regard for facts, engineers expect individuals and situations to be governed by reason. Actually, the psychologists tell us man's motivation is essentially emotional. Consequently, the engineer needs to know more about leading and handling people.

Second, engineers are an alert group intellectually and are likely to be impatient with the degree of understanding and work pace of others.

Third, engineers are inclined to narrow interests. They concentrate on their chosen field to a degree that dwarfs the other functions of the business in their mind.

Reistle, of Humble Oil & Refining Company, at the Petroleum Engineering Management Conference at the University of Oklahoma in 1952, stated: "The important thing is for the engineer to find his own place in society—to find his place where his peculiar talents can accomplish the greatest good. His recompense will not only be in monetary terms but also in the more soul-satisfying rewards of universal respect and admiration."

When an engineer becomes an executive he must develop new skills and wider scope of thinking. His job changes fundamentally from one of doing to one of directing. As an executive he devotes the major portion of his time to planning for, and directing the activities of others. He changes from a technician to an administrator whose function is to direct the operations of his company in a most efficient manner. To do this he must know and want to work with people. He must be able to secure the cooperation and maximum effort of all individuals under his direction.

Here are ten basic qualifications for a successful leader. How many do you have? . . .

1. ***Desire for Achievement***—**a desire to do something more, better and faster than anyone else.**
2. ***Mobility Drive***—**feeling the need not only for doing something, but to move continually upward.**
3. ***Self Reliance***—**The ability to take calculated risks with a minimum of anxiety.**
4. ***Perception***—**ability to understand and see things as a whole, in proper relation and perspective.**
5. ***Visualization***—**ability to plan, visualize or picture intricate problems.**
6. ***Original Thinking***—**ability to be creative and have "ideas."**
7. ***Stable Personality***—**ability to understand one's self.**
8. ***Knowledge of Human Relations***—**ability to work with people to have an understanding and insight into the behavior of others.**
9. ***Dependability***—**to be able to be relied upon.**
10. ***Capacity to Delegate Authority As Well As Responsibility.***

However, the concept of management knowledge and skills is ever-changing. We have learned that there are certain qualifications or traits of character which make for a successful executive. Psychologists and industrial leaders have attempted to define the basic qualities that contribute toward a successful executive. (See above.)

Most of the studies concerning qualities necessary for a successful executive or manager, however, still deal in generalities. A few types of executive positions have received detailed study and attention, such as the sales executive's position, but as a whole executive traits and qualifications have not been narrowed sufficiently to define exactly the mental, emotional and psychological requirements of the varied types of executive positions in various companies and industries.

This is true particularly in the area where a professional executive is required to manage other professional people. With all that has been done, there is still much to be accomplished in the field of executive selection and development.

In industry, the changes in manufacturing production techniques and processes vary in accordance with the industry's adoption of automation. Certain types of industries are advanced in automation principles to the degree that any changes for years to come will represent minor refinements. Other industries have just begun to

apply advanced engineering principles to their production methods.

The industries that are utilizing the latest engineering methods by their very nature have more need for professional engineers. As the processes become more complicated, decision making at the management level requires an increasing amount of knowledge pertaining to engineering and production principles. Where there was formerly an administrative executive making manufacturing decisions, the administrative executive is now an engineer trained both in engineering and administrative problems. Whether the engineer desires it or not, the future will find his playing an even greater role in management functions and decisions.

Need to Broaden. We are all creatures of habit. After a number of years of doing things in certain ways we develop attitudes and opinions that to a degree become stereotyped. When the engineer is removed from these specialized surroundings and work environment, and forced from a technical to an administrative position, is it any wonder that he applies his former approaches to problems in his new area of responsibilties? Engineers as executives have a tendency to carry over their engineering philosophy and to try to predetermine and control human activities as they formerly dealt with physical or mathematical processes. The transition from controlling things to getting work done through people requires a sharpening of social skills.

The attitudes of industry toward engineers' qualifications and training has changed considerably in recent years. Responsible educators and industrialists now agree that fragmentized education is not sufficient for the development of engineers who are to become management executives.

Oil's Executives. The manufacturing executive is normally an engineer who has been promoted from the ranks. The head of the production and exploration division of an oil company are normally executives with degrees in petroleum engineering or geology. The pipe line senior executive often has a degree in some branch of engineering. The major portion of today's management decisions are technical in nature and require an executive in charge to have some technical training so that he may properly evaluate the facts and give a quick and intelligent decision. In the oil industry this is becoming more true even in the field of sales.

As more and different chemical products are refined from petroleum, the salesman must have some engineering training so that he may be able to speak in technical terms to customers of the product's specifications, properties and abilities to perform. He must also be able to study the customer's requirements in order to recommend modification or changes in the product so that it will suit the customer's needs. This is basically why engineers have been trained in the sales field and have become what is known as sales engineers.

This change in management complexity will happen to other companies in other industries as they gradually become more mechanized and use complicated manufacturing techniques.

The future represents a change in thinking in the engineer himself. The present school of thought of those who attempt to pigeonhole the engineer through psychological studies do not take into consideration the fact that it's not so much what the ideal environment for an engineer is, but what he will have to fit himself into in the future. He can no longer enter the engineering profession and get ahead solely on the basis of his engineering knowledge. He now must become an administrator and a leader of men, as well as an engineer. Regardless of what is written and said of the engineer and his job, there can be no getting away from the fact that there is a slow but sure evolution of the engineering function in the industrial environment; not only because of industrial technical changes, but because the engineer himself is seeking newer and broader fields to conquer. He wants to apply the principles of his training to all phases of management. He will do it successfully, too, if he does not omit an important part of his training; that is in the field of human relations. He must also learn to make quick decisions of judgment even where all the facts are not available.

The engineer today stands on the threshold of a new and greater horizon. He has proven that his capabilities are unlimited where initiative is allowed to reign. He will be the future leader to whom free enterprise will be entrusted. It is for the future to see ties and his place in the industrial bilities and his place in the indutrial world. —**The End**

ERRATA

SOME MINOR errors appeared in the article entitled Dampening High-Speed Pump Pulsations, June, 1956, PIPE LINE INDUSTRY, Pages 38-44.

On Page 39, the definitions of the symbols L, R, and R_o in the second column should read . . .

L = inductance of choke tube, pound-force times second^2 per foot^5.

R = pipe resistance, pound-force times seconds per foot^5.

R_o = surge resistance of pipe line, pound-force times second per foot^5.

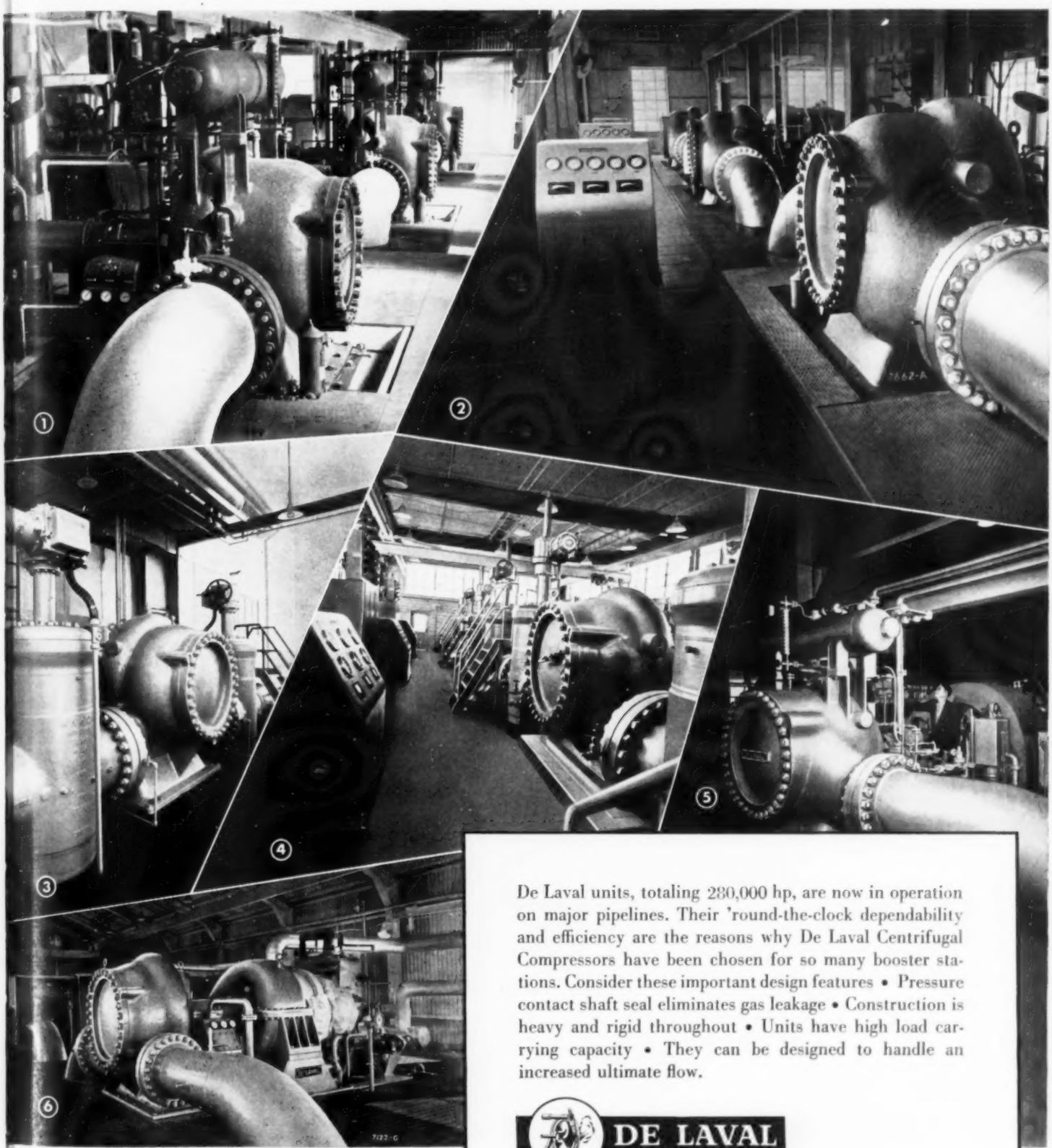
Equation (20b) on Page 41 should read . . .

$$\frac{P_L}{P_o} = \sqrt{\frac{1}{\left[\left(\frac{\omega L}{R_o}\right)^2 \frac{CR_o^2}{L} - 1\right]^2 + \left(\frac{\omega L}{R_o}\right)^2 \left(\frac{CR_o^2}{L}\right)^2}} \qquad (20b)$$

The end of the third paragraph, second column, Page 42 should read: "The case of zero surge resistance is particularly important because the choke tube resistance is then the only resistance left to limit the magnitude of pump pulsating pressure if the pump should generate a pulsating flow *at* the resonant frequency of the surge chamber-choke tube combination. This condition occurs when: . . ."

In the first line of the second column, Page 44, the pump speed of 69 rpm should have read "the pump speed of 70 rpm."

These pipelines depend on **DE LAVAL** *Centrifugal Compressors*



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4. *Texas Eastern Transmission Corporation*
5. *United Gas Pipe Line Company*
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. . . reduce maintenance and down time costs

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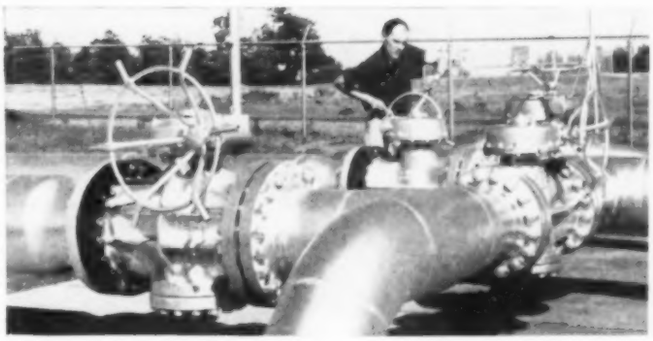
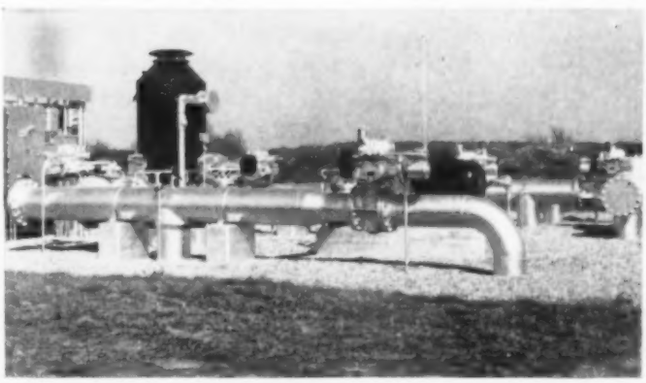
For forty years, pressurized lubricant sealing in Rockwell-Nordstrom valves has proven the safest way to control natural gas. And lubricant sealing *stays* safe . . . a turn of the lube screw provides a new seating surface *instantly*. Reseating costs and down time are lower than with any other valve.



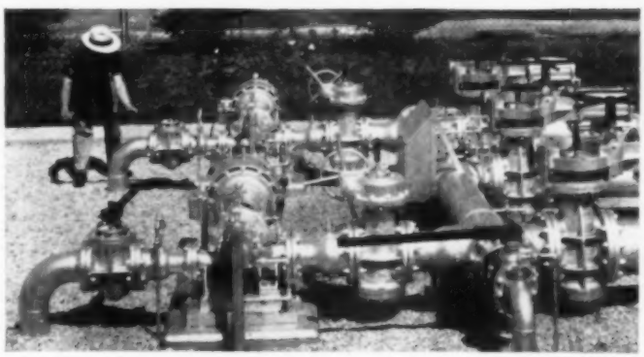
CRUDE PIPELINES

Quarter-turn operation in Rockwell-Nordstrom valves means faster, smoother closure at any pressure. Straight-through flow prevents packing and seat fouling (Rockwell-Nordstrom valve seats are *never* exposed to line fluid). Also, the firmly seated plug and rugged construction prevent costly shock load failures on pulsating flow.



PRODUCTS PIPELINES

Tight manifolding is easier with *compact* Rockwell-Nordstrom valves. Product contamination is eliminated by leakproof, positive shut-off. And lubricant prevents metal-to-metal friction wearing to slash maintenance costs. For power operation, quarter-turn, lubricated closure means simpler, less costly actuators.



Rockwell-Nordstrom valves are available in a complete range of sizes and pressure ratings for every pipeline need. We'll be glad to send you more information on how you can stay on stream at lower cost with Rockwell-Nordstrom pipeline valves. Rockwell Manufacturing Company, Pittsburgh 8, Pennsylvania. *Canadian Valve Licensee:* Peacock Brothers, Limited.

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Rules of Thumb

FOR THE PIPELINER'S NOTEBOOK

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These formulae from the pages of engineers' own notebooks yield rough, but reasonably accurate answers for design, maintenance and supply questions. The Editors will pay $15 for your pet Rule of Thumb. Send your Rule of Thumb to PIPE LINE INDUSTRY, P. O. Box 2608, Houston 1.

Pipe Line Construction

—17—How to estimate the cost of a pipe line in the Rocky Mountain area.

Rule: Multiply the nominal diameter of the pipe in inches by $3500 to get the cost in dollars per mile. This rule covers construction costs, freight, materials, right-of-way, engineering and inspection. It is based on blasting for not more than 20 percent of the line and a trench-padding of 6-8 inches on 30-35 percent of the line.

Example: Estimate the cost of laying 100 miles of 26-inch line in the Rocky Mountain area.

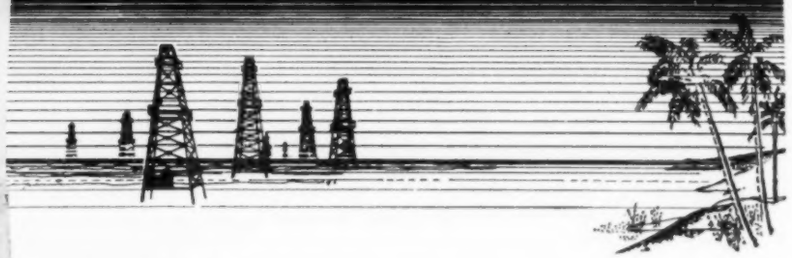
$$\text{Cost} = 26 \times 3500 \times 100 = \$9{,}100{,}000$$

Actual costs will vary as the amount of blasting and trench-padding varies from the values noted above. Terrain features and hauling distances should also be taken into account.

PIPE LINE TRENCHING

16/60 Model Trencher digging in hard sand

in the MIDDLE EAST



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ALLEN TRENCHERS

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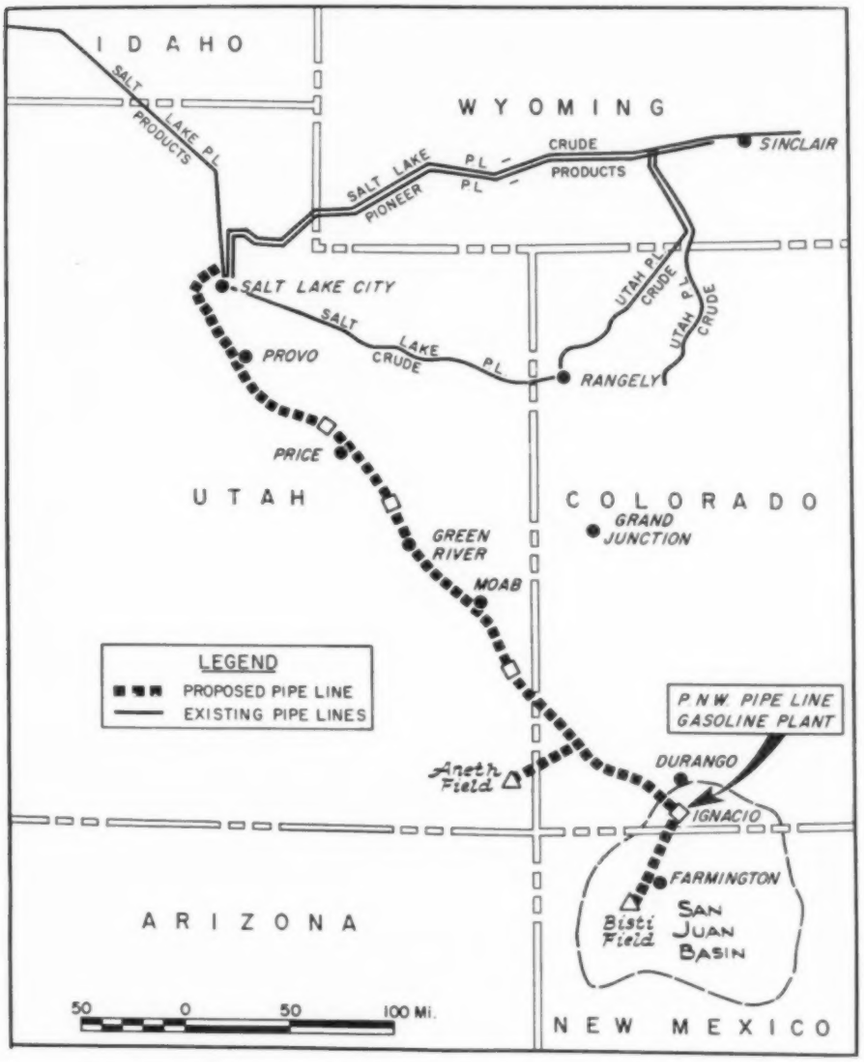


Proposed route of Pacific Northwest's new crude and products line from the Four Corners area to Salt Lake City.

Pacific Northwest Subsidiary to Build 350-Mile Crude and Products Line

A 350-mile $15 million crude oil and products line from the Four Corners area to Salt Lake City, Utah, has been announced by Pacific Northwest Pipeline Corporation. Through its subsidiary, Northwest Production Corporation, Pacific Northwest has formed Northwest Pipeline Corporation to construct and operate the new line.

Northwest Pipeline will transport crude oil now being developed in southeastern Utah and northwestern New Mexico to refineries in the Salt Lake area. The line also will carry products from Pacific Northwest's Ignacio, Colo., gasoline plant.

Initial capacity of the 8-inch line will be 15,000 barrels per day. Fish Engineering Corporation, designers of Pacific's natural gas line, estimates the system, including pump stations and storage facilities, will cost $15 million. It is expected to be in operation within 12 months.

The new line, originating at the Ignacio gasoline plant south of Durango, Colo., will go direct to the refining center at Salt Lake City. One third of the new line will be constructed on Pacific's existing right-of-way.

The proposed facilities will tie in with existing pipe lines to marketing outlets serving major centers in the Pacific Northwest area. Lateral lines will connect the Bisti field in northwestern New Mexico and the Aneth field in southeastern Utah to the main line.

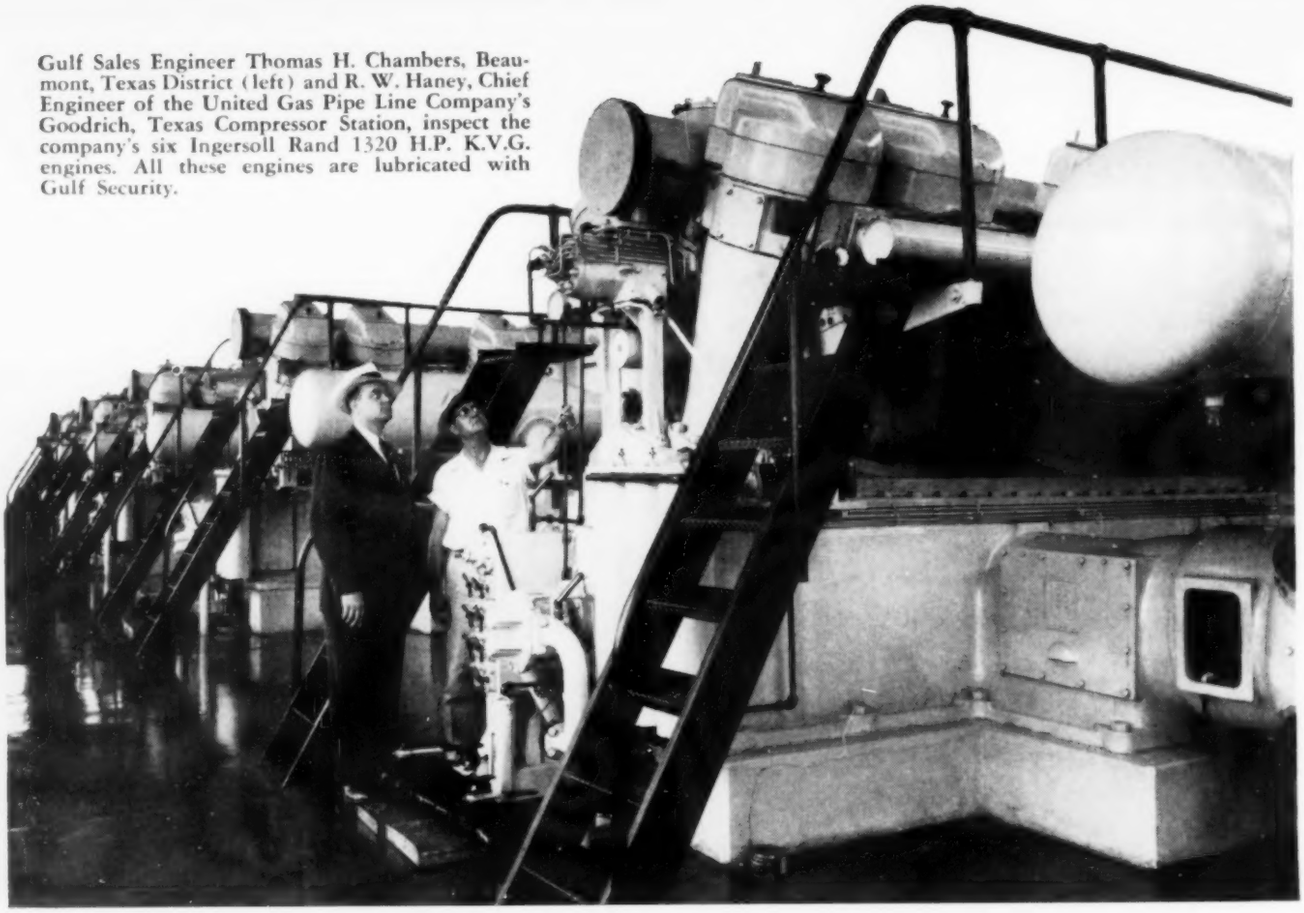
Reservoir engineers estimate oil reserves in the Four Corners area to be more than sufficient for initial pipe line requirements. Initially the pipe line will be powered to move approximately 8000 barrels of crude daily and about 7000 barrels of light products daily from Pacific Northwest's gasoline plant. The line's capacity can be increased to 25,000 barrels daily should reserves in the area warrant such expansion.

El Paso Natural Proposes $84 Million Gas Project

An $84 million project including 888 miles of field and main lines and 56,990 horsepower in compressor capacity has been presented for approval to the Federal Power Commission by El Paso Natural Gas Company.

Designed to provide an additional 150 million cubic feet of natural gas daily to customers in California, the facilities will be located in Texas, New Mexico and Arizona. They will be used to deliver an additional 75 million cubic feet of gas per day jointly to Southern California Gas Company and Southern Counties Gas Company of California and an additional 75 million cubic feet to Pacific Gas & Electric Company.

The Southern California and Southern Counties companies will re-



Gulf Sales Engineer Thomas H. Chambers, Beaumont, Texas District (left) and R. W. Haney, Chief Engineer of the United Gas Pipe Line Company's Goodrich, Texas Compressor Station, inspect the company's six Ingersoll Rand 1320 H.P. K.V.G. engines. All these engines are lubricated with Gulf Security.

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Make certain your units receive safe, effective lubrication protection—specify Gulf Security. And remember that Gulf provides the services of a trained, experienced petroleum expert—the Gulf Sales Engineer—to help you with any problem involving a petroleum product. Consult the telephone directory for the number of your nearest Gulf office.

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ceive their supply near Blythe, Calif., and Topock, Ariz. Pacific Gas & Electric's supply will be delivered near Topock. The gas would come from the Permian Basin and Panhandle fields in Texas and the San Juan Basin in New Mexico.

In another project El Paso Natural has received temporary authorization to construct and operate $5 million in proposed facilities in Andrews and Ector Counties, Texas. The project includes 65 miles of gathering lines, compressor station and metering and communications facilities for gathering, processing and transporting additional gas. It also includes 16 miles of 20-inch, 16 miles of 4½-inch liquid products line, 11 miles of 4½-inch fuel line and a gasoline plant.

TGT Receives Authorization For $20 Million Project

The Federal Power Commission has given temporary authorization to Tennessee Gas Transmission Company to build 162 miles of main line and 13,940 compressor horsepower costing $20.3 million.

Tennessee Gas proposes to construct 99 miles of 26-inch main line loop in Ohio and Pennsylvania; 63 miles of 30-inch loop in Kentucky; and additional 13,940 compressor horsepower at stations in Massachusetts, Louisiana, Mississippi and Tennessee.

Socony and Sinclair Plan $25 Million Venezuelan Line

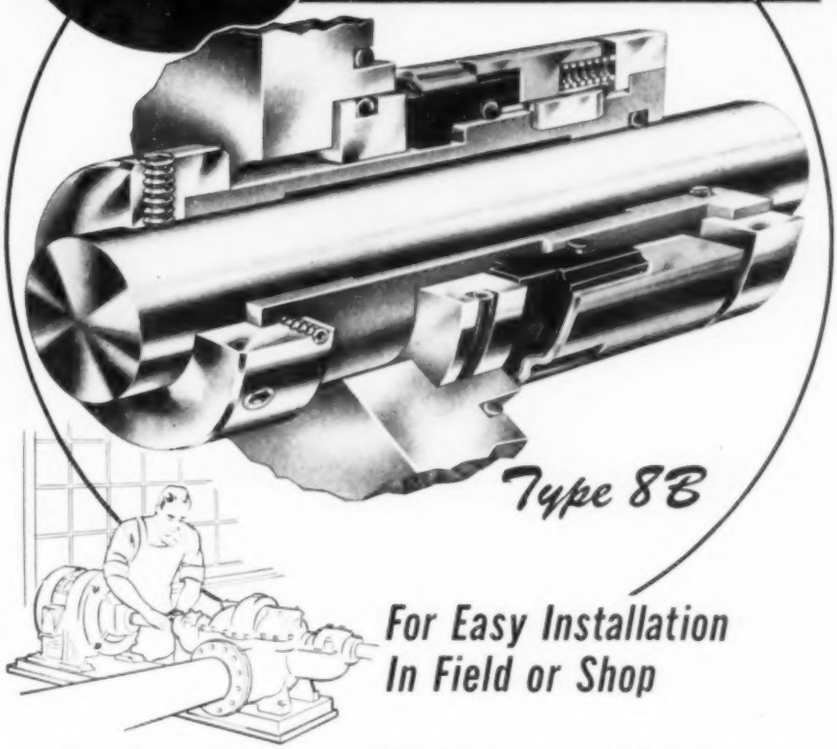
Construction is expected to get underway in December on the 211 miles of 20-inch pipe line from Silvestre field, near Barinas, to El Palito on the Caribbean Coast near Puerto Cabello, Venezuela. The line will be owned 75 percent by Socony Mobil Oil Company de Venezuela and 25 percent by Sinclair Oil and Refining Company.

The line will have an initial capacity of 100,000 b/d with one pump station. Facilities could be increased to 150,000 b/d with an intermediate booster station.

The project is expected to be completed for operation by January, 1958. Including a deep sea loading terminal, the project is estimated to cost $25 million. Magnolia Pipe Line Company, Dallas, is handling engineering and design.

JOHN CRANE

PACKAGED TYPE MECHANICAL SEALS FOR High Pressure Pipe Line Pumps



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Manufacturers of large centrifugal pumps and pipe line operating engineers have long been asking for an end face mechanical seal meeting these requirements: 1) heavy-duty design to handle high pressure applications; 2) single-unit packaged construction for easy installation; 3) a full range of sizes to meet individual specifications.

"John Crane" has met this need with the Type 8B hydraulically balanced seals for pressures to 1200 psi.

These seals can be quickly installed and adjusted simply by sliding the entire unit along the shaft into final position. Removal of the top casing is not necessary. This feature alone results in the saving of many man-hours of maintenance work.

Field reports and performance records point to the steadily increasing use of "John Crane" high pressure seals to eliminate problems connected with the handling of hydrocarbons, crudes, gasoline and other petroleum products.

To help you in your individual requirements, "John Crane" offers nationwide service—available without obligation from strategically located factory owned branch offices.

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JOHN CRANE CRANE PACKING COMPANY

UNMATCHED ACCURACY

in direct flow indication

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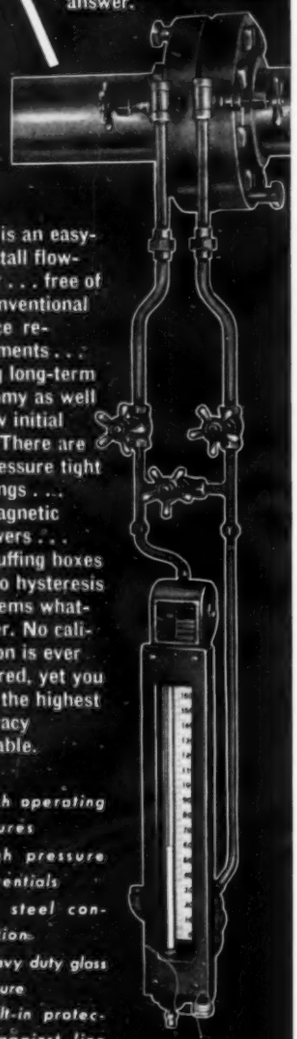

Here is an easy-to-install flowmeter . . . free of all conventional service requirements . . . giving long-term economy as well as low initial cost. There are no pressure tight bearings . . . no magnetic followers . . . no stuffing boxes . . . no hysteresis problems whatsoever. No calibration is ever required, yet you have the highest accuracy available.

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★ High pressure differentials
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Clearing Progresses on West Coast Line

Conyes Construction Corporation, one of the four contractors on Westcoast Transmission Company's 650-mile natural gas line in Canada, expects to complete clearing operations on the 210-mile section from near Williams Lake to Merritt, B. C., before freezing weather sets in again this year. A clearing method developed by Conyes and being incorporated on other spreads is helping to cut clearing time in half. Usable lumber is cut and piled separately. The remaining lumber is cut into 15-foot lengths for burning along with brush and stumps.

Natural Gas Pipeline Gets Approval for Texas Project

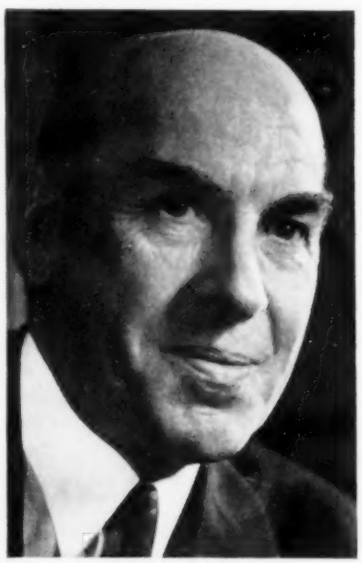
A $3 million pipe line project enabling Natural Gas Pipeline Company of America to take 20,000,000 cubic feet of natural gas daily from the Quinduno field in Roberts County, Texas, has been authorized by the Federal Power Commission.

Natural proposes to build about 25 miles of line from Quinduno field to connect with its existing system; 5280 horsepower in compressor stations; and field lines and metering facilities.

New York State Natural Receives O.K. for 17-Mile Line

New York State Natural Gas Corporation has received temporary authority from the Federal Power Commission to construct 17 miles of natural gas pipe line costing $1.9 million.

In an original application the company proposed to replace 56 miles of pipe and install an additional 2000 horsepower engine at its Boom compressor station, Tioga County, Penn. The company plans to replace all its 20-inch line in the counties of Tioga, Penn., and Steuben, Chemug, Schuyler, and Tompkins, N. Y., with 30-inch pipe. Estimated cost of the program is $7 million.



—*Karsh*

T. H. ATKINSON, M.C., of Montreal, has been elected a member of the Board of Directors of Trans-Canada Pipe Lines Limited, and appointed chairman of the finance committee of the Company, N. E. Tanner, president of Trans-Canada, announces. Mr. Atkinson was formerly vice-president and general manager of the Royal Bank of Canada, having retired in December, 1955. He continues to serve on the Board of Directors of the Bank, is a director and a member of the Executive Committee of the Montreal Trust Company, and a Director of Liquid Carbonic Canadian Corporation Limited. During his 44 years of service with the Bank, Mr. Atkinson rose from the position of junior clerk in Newcastle, N. B., to the distinguished executive post he relinquished last year.

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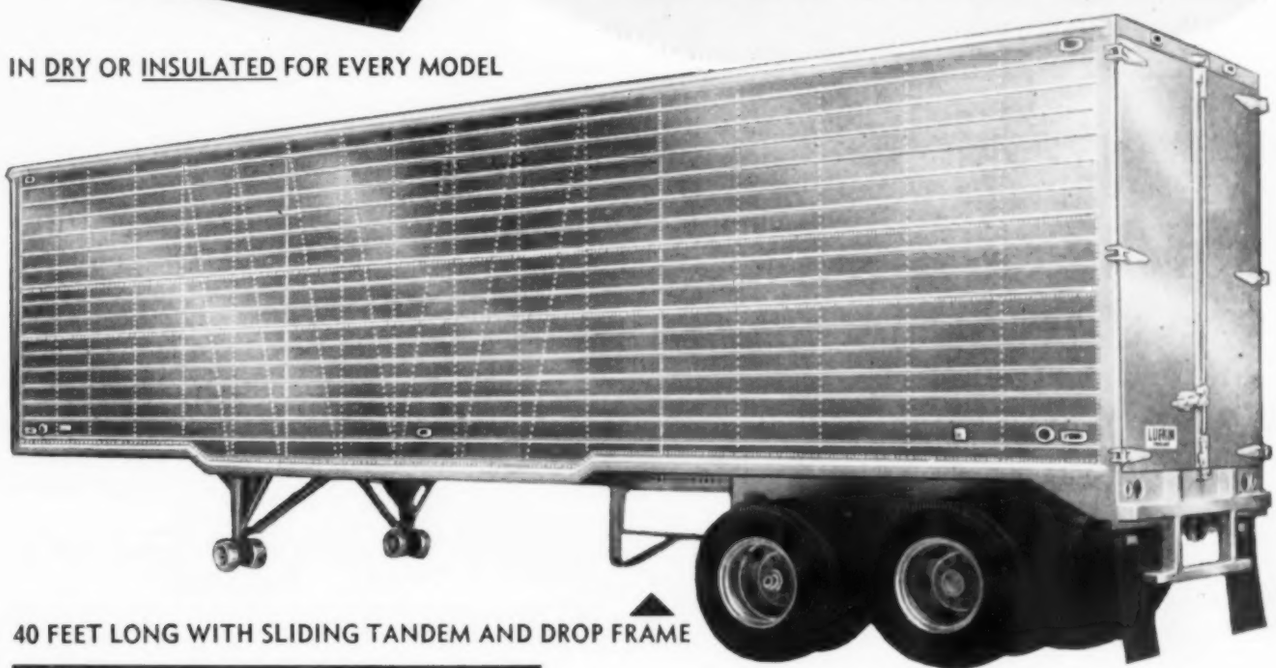
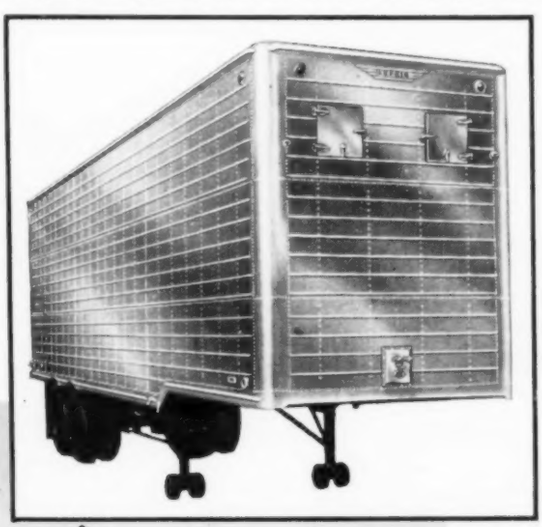
- MODEL FVLA–COMBINATION STEEL AND ALUMINUM
- MODEL FVL–ALL STEEL

IN DRY OR INSULATED FOR EVERY MODEL



40 FEET LONG WITH SLIDING TANDEM AND DROP FRAME



Drop Frame Van with 2270 cu. ft. inside – 6 inch or 24 inch radius corners optional.

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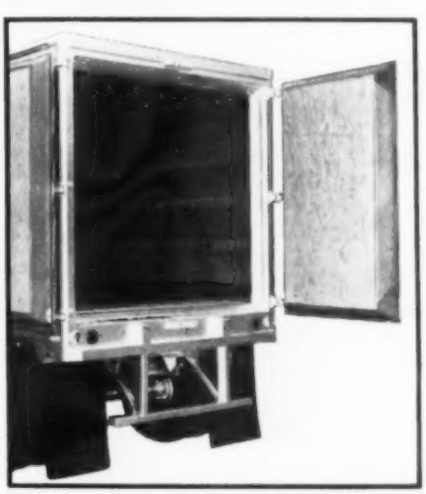

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One Spread Kicks Off On Trans-Canada Line

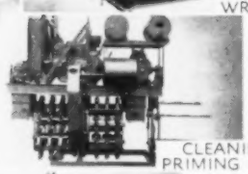
In spite of an anticipated delay in delivery of additional pipe caused by the steel strike in the U. S., work is under way on the Alberta-Winnipeg portion of the 2250-mile natural gas pipe line of Trans-Canada Pipe Lines Ltd.

Contracts have been awarded on four spreads and at least one spread was to begin work in late July. Contracts and mileages on the line include Majestic Contractors Limited, 104 miles from Burstall to Stewart Valley; Canadian Bechtel Limited, 110 miles, Stewart Valley to Moose Jaw; Mannix Limited, 96 miles, Moose Jaw to Candiac; and Dutton Williams Brothers Limited, 88 miles, Candiac to Willen. All points are in Saskatchewan except Willen, Manitoba.

Canadian Bechtel Limited began clearing right-of-way in June and was to kick off in late July. Available pipe was to be allocated to Bechtel and Majestic for the first two sections east of Alberta. Trans-Canada has set up offices at Swift Current, Regina and Brandon.

PERRAULT PNEUMATIC INSIDE LINE-UP CLAMP

COATING AND WRAPPING MACHINES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The first line-up clamp to align pipe center-on-center so that any inconsistencies in diameter are distributed all around, eliminating the time and damage of hammering. The air-operated studs bring pipe to a perfect circle, mating it perfectly, holding it rock-steady edge-to-edge, ready for a good stringer bead. It's easy to position, fast and easy to use. Available for pipe from 20" thru 36" on a rental basis. For the complete, wonderful details, write or phone . . .

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Royal Dutch Shell Plans $280 Million European Line

A $280 million crude oil pipe line spanning western Europe from Marseilles on the Mediterranean coast to seaports on the North Sea is being considered by Royal Dutch Shell and other companies.

The route of the main trunk line, which would be approximately 700 miles long, would cross eastern France, Luxembourg, West Germany, the Netherlands and Belgium. Two routes are being considered for the portion of the line from West Germany to the North Sea. One terminates at Rotterdam and the other at Wilhelmshaven, Germany.

Reports are that the main line would be of 30-inch pipe. Completion of the line would make possible construction of new oil refineries near centers of consumption rather than at ports accessible to tankers. Oil to be moved through the line would be brought to the southern terminus by tanker from the big Middle East fields. The tanker voyage and cost of carrying Middle East crude to western Europe would be considerably decreased by the proposed line.

South Saskatchewan Receives Permit for 59-Mile Extension

Construction was to begin in July on South Saskatchewan Pipe Line Company's 69-mile extension of the main pipe line system from Cantuar field to Regina, Sask. The extension from the Dollard to Cantuar oil fields will connect with an existing line from Cantuar to Regina and will provide main line service from the Dollard field to Regina.

The permit was issued by Saskatchewan's Minister of Mineral Resources after hearings took place on an application of Royal Pipe Lines Co. Ltd. to serve the same area by an alternate route.

South Saskatchewan Pipe Line expects to complete construction on the $2.9 million 12-inch crude line connecting Bone Creek, Gull Lake, North Premier and Dollard fields by early fall.

The initial throughput of the new addition to the company's system is expected to be 10,000 barrels per day. The extension is expected to increase recoverable oil reserves available to South Saskatchewan Pipe Line from 163 million barrels to 242 million barrels.

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an accident rate 1/6th that of the industry average.

On H. C. Price Co.'s five pipeline construction spreads, the work of full-time safety engineers has helped net provable results . . . a record which boasts an accident rate kept to less than 1/6th that of the industry average!

These results are included in two new Awards for Safety presented H. C. PRICE CO. by the *Joseph A. Holmes Safety Association.**

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"for the outstanding frequency rate of 7.4 from December 1, 1954 to November 30, 1955, in pipeline construction against a national average of 46.2."

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H. C. Price Co. is proud that its long established safety program continues to merit important recognition . . . and to pay larger dividends to our personnel and customers.

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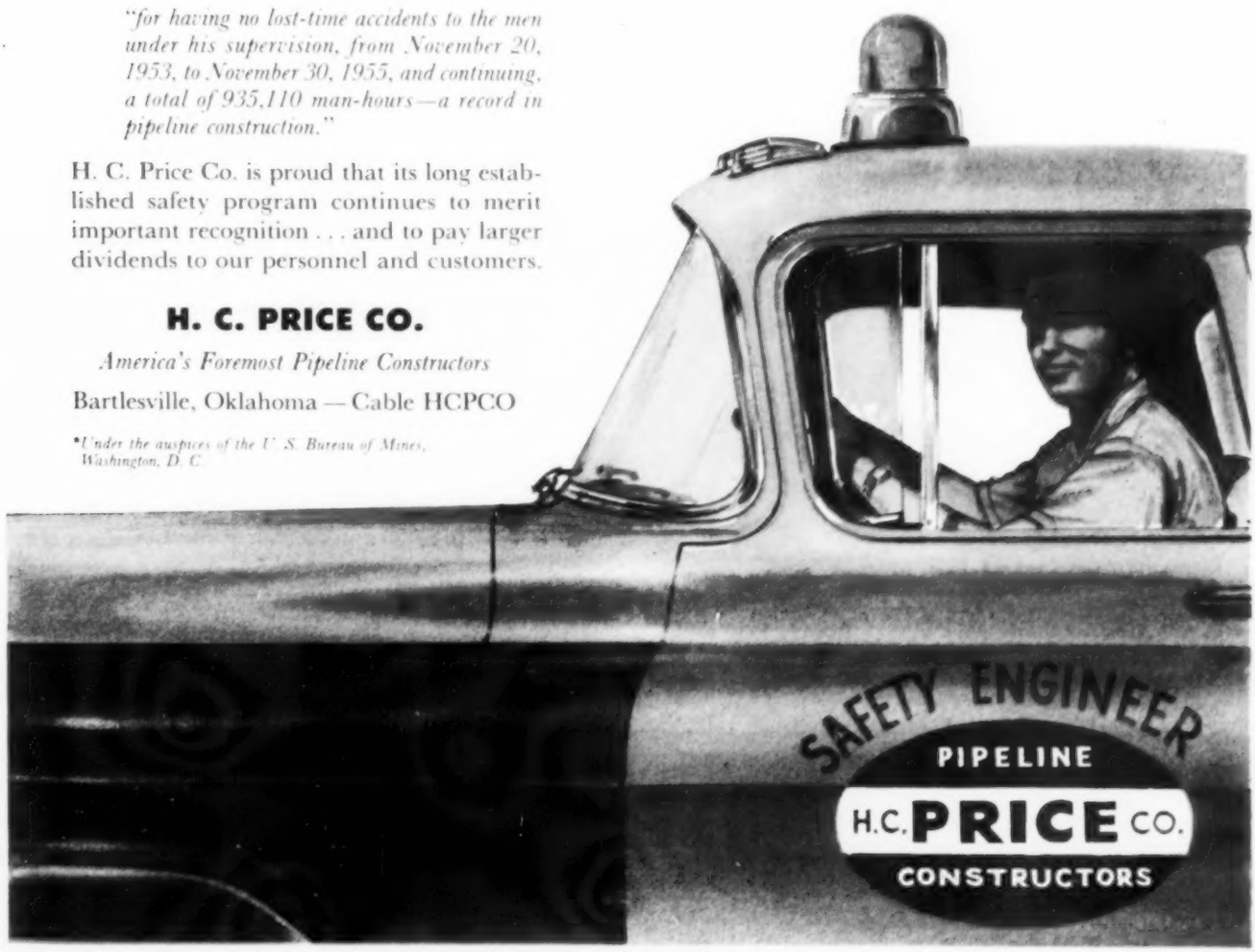


For more data on advertised products, use Readers' Service Cards, last page.

Canadian Hydrocarbons Plans $60 Million Pipe Line Project

The Canadian Parliament has approved a permit for a $60 million petroleum products pipe line from Alberta to Lake Superior for Canadian Hydrocarbons, Ltd. Construction of the 800-mile line will be carried out by a subsidiary, Hydrocarbon Pipelines Ltd.

The 6- and 8-inch line will carry propane, natural gasoline, butane and other hydrocarbons through Winnipeg to the Lakehead area for transport to eastern Canada by tankers. The project will make products available to rural areas and link refineries and processing plants en route.

Construction is expected to begin in early spring and be completed during the fall of 1957.

Anderson Bros. Sells Out Contracting Business

Anderson Bros. Corporation, pipe line contractors for the past 15 years, has transferred its pipe line contracting assets to Brazos Equipment Rental Company of Houston and received in return uranium interests. Carl Anderson, president of Anderson Bros., has been active recently in mining and exploration in New Mexico.

Construction equipment in Texas, Montana, Wyoming, Minnesota, Louisiana, Ohio and North Carolina was acquired by Brazos Equipment in the transaction. Paul E. McDaniel, owner of the firm and also president of Brazos Engineering Company, Inc., has announced that the equipment will be available to pipeliners on a rental basis.

Recently Anderson Bros. disposed of its pipe line equipment in Venezuela, Colombia and Canada.

New Facilities Authorized For Kansas-Nebraska Natural Gas

Kansas-Nebraska Natural Gas Company has received Federal Power Commission authorization for the construction and operation of $4 million in natural gas facilities in Nebraska, Kansas and Colorado.

Kansas-Nebraska will install 32 miles of line and additional compressors at five locations on its interstate system in Kansas and Nebraska, increasing the compressor stations' capacity by 2700 horsepower.

ASCE Announces Formation Of Pipe Line Division

The American Society of Civil Engineers has announced the establishment of a Pipe Line division, advancing the status of pipe line members in the civil engineering group.

Activities in the field formerly were handled by the Committee on Pipelines of the Construction division. The new division is created to satisfy a need for specialized technical and professional study, development and practice.

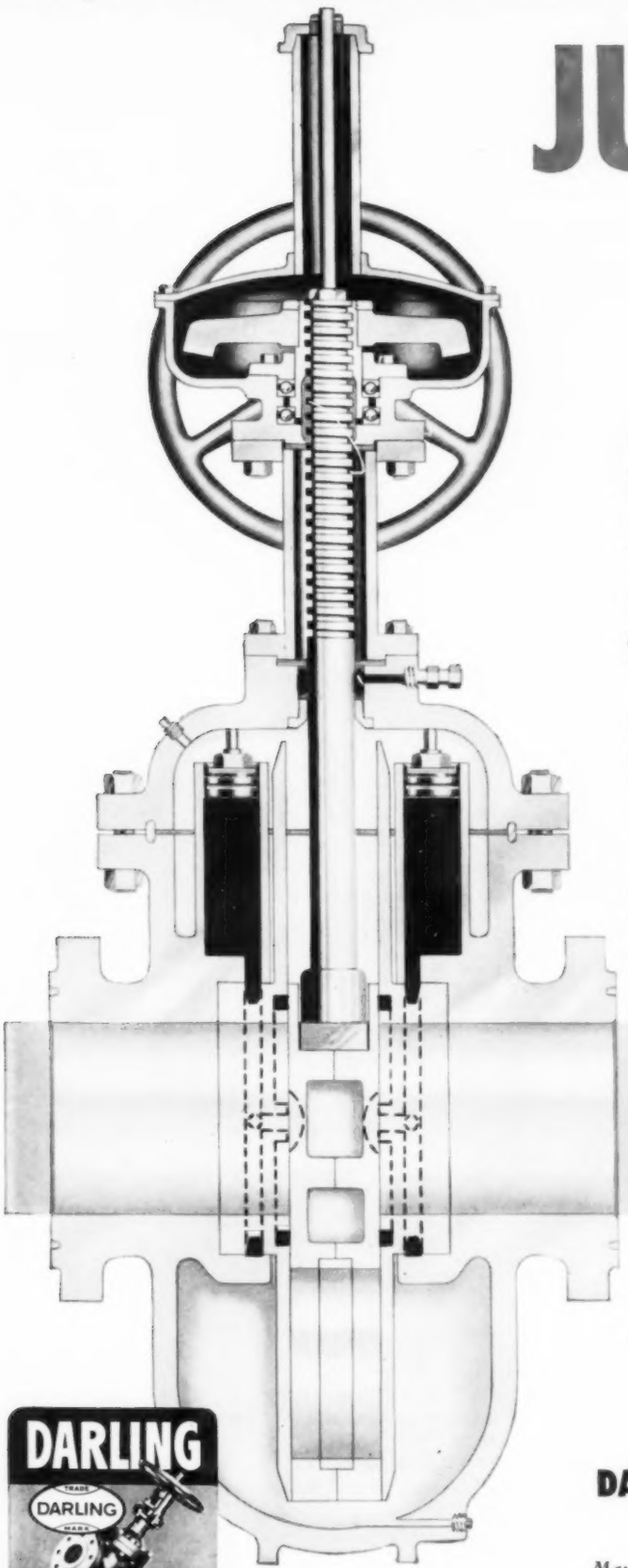
A meeting of the Pipe Line division has been scheduled for October 15-19 at the William Penn Hotel, Pittsburgh. Subjects of papers to be presented at the meeting include methods of making pipe, pipe line problems in metropolitan areas, right-of-way problems, pressure pulsation tests, coordination of corrosion control, and advances in steel pipe products.

Proposed Pipe Line Construction

COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Alberta Gas Trunk Line, Ltd.	547	6-34	Gas	From Alberta fields to western terminus of Trans Canada Pipe Line, Ltd.	$47 million	Approved
American Gilsonite Company	71	6	Gilsonite Slurry	From Bonanza, Utah, to Gilsonite, Colo.	$2 million	Approved
American Louisiana Pipe Line Company	121	22	Gas	Payne, Ohio to Bridgman, Mich.	$7.8 million	Contracts let
Andes Pipeline Corp.	500	12	Gas	From Villamontes, Bolivia, across Andes to Antofagasta, Chile	$30 million	Planned
Bolivian Gulf Oil Co.	201	....	Crude	Sicasica, Bolivia to Arica, Chile	.....	Planned
Chaco Pipeline & Refinery Corp.	450	....	Products	From Glenn McCarthy's Bolivian wells to new refinery at Conception, Paraguay	.....	Planned
Cities Service Gas Co.	35	6, 12, 16	Gas	Facilities in Kansas, Missouri, and Oklahoma	$2.8 million	Authorized
Coastal Transmission Corp.—Houston, Texas	565	20-26	Gas	McAllen, Texas—Louisiana connection, Houston, Texas Gas, plus 272 miles of laterals	$68 million	Before FPC
Colorado Interstate Gas Co.	800	16-30	Gas	Laramie, Wyo. to Beatrice, Neb. to deliver gas from Rocky Mountain area and Texas and Oklahoma Panhandle fields to Natural Gas Pipe Line Co. of America	$76 million	Before FPC
Compania Shell de Venezuela	177	20	Gas	La Paz field to Cardon refinery on Paraguana peninsula	$20 million	Planned
Consolidated Gathering Systems, Ltd.	198	...	Crude	Sturgeon Field—Edmonton	.....	Planned
Creole Petroleum Corp.	16	34	Crude	Pachaquero to Lagunillas, Venezuela	$2 million	Contract let
	94	28	Crude	Temblador to Caripito, Venezuela	$5.6 million	Planned
Deep Rock Gas Co.	120	6	LPG	Tioga, N.D.—Canadian border	.....	Planned
El Paso Natural Gas Co.	888	....	Gas	Facilities in Texas, New Mexico, and Arizona to deliver gas near Blythe, Calif. and Topock, Ariz. to So. Counties Gas Co., So. Calif. Gas Co. and Pacific Gas & Electric Co.	$84.5 million	Before FPC
	108	...	Gas & Products	Facilities in Andrews and Ector Counties, Texas	$5 million	Authorized
El Paso Natural Gas Products Co.	240	8	Products	Midkiff natural gasoline plant in Permian Basin to El Paso	.....	Planned
Gulf Oil Corp.—Pittsburgh, Penn.	33	8	Crude	Citronelle, Ala. field to Mobile	.....	Contract let
Houston Texas Gas & Oil Co.—4604 Main St., Houston	961	12-30	Gas	Baton Rouge, La. to Miami, Fla. plus 496 miles of laterals and compressor facilities	$105 million	Before FPC
Hydro-Carbons Pipe Line, Ltd.	800	....	LPG	Edmonton to Winnipeg with gathering system and storage	$60 million	Contracts let
Inland Natural Gas Co.	320	6-12	Gas	To tap Westcoast Transmission's trunk line at Savona, British Colombia.	.....	Planned
Interprovincial Pipe Line Co.	150	20	Crude	Sarnia, Ont. to Toronto, Ont.	.....	Planned
Interstate Oil Pipe Line Co.	55	8	Crude	Billings, Mont. to Wolf Springs, Mont.	.....	Considered
Iraq Petroleum Co.	50	24	Crude	Homs, Syria, to Mediterranean	.....	Considered
Iron Ranges Natural Gas Co.	115	....	Gas	From Itasca and St. Louis Counties along route of Mesabi range from Grand Rapids to Aurora, Minn.	$5 million	Before FPC
Iroquois Gas Corp.—Buffalo, N.Y.	36	....	Gas	Facilities in Chautauqua, Cattaraugus and Erie counties, N.Y. to develop new underground storage area for natural gas	$2.8 million	Authorized
Kansas-Nebraska Natural Gas Co.	32	....	Gas	Facilities in Nebraska	$4 million	Authorized
Magna Pipeline Company	40	....	Gas	Underwater line from Anacortes, Wash. to Victoria, B.C.	$6 million	Planned
Magnolia Pipe Line Co.	...	8, 12	LPG	Facilities in Andrews County, Texas	.....	Planned
Mene Grande Oil Co.	62	30	Crude	Anaco to Puerto La Cruz, Venezuela	$5.8 million	Considered

Why DARLING-McEVOY 2-way conduit gate valves

JUST CAN'T LEAK!



IT'S simple. Regardless of flow direction, a sealant *automatically* completes a pressure-tight seal between the downstream seat and gate. This is the inevitable result of pressure differential at the time of closure.

Similarly there can be no behind-the-seat leakage! For, as shown here, each seat is *double-grooved* to seal against the valve body as well as the gate.

It is this unique feature, with its positive, automatic self-sealing, that establishes the Darling-McEvoy conduit gate valve as the world's tightest!

Isn't it likely that you could benefit by such valve performance as time goes on? Get the *whole* story . . . get details on this and the other unusual features that make these field-proved valves truly outstanding for low-cost, trouble-free operation. Just ask for Bulletin 5402.

Section view of Darling-McEvoy 2-way conduit gate valve, showing twin sealant reservoirs, double-gate parallel seat design, and sealing grooves. Sizes: 8 inch and larger.

DARLING TRADE DARLING MARK VALVES

DARLING VALVE & MANUFACTURING CO.

Williamsport 27, Pa.

Manufactured in Canada by Sandilands Valve Manufacturing Co., Ltd., Galt 19, Ont.

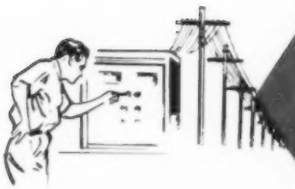
For more data on advertised products, use Readers' Service Cards, last page.

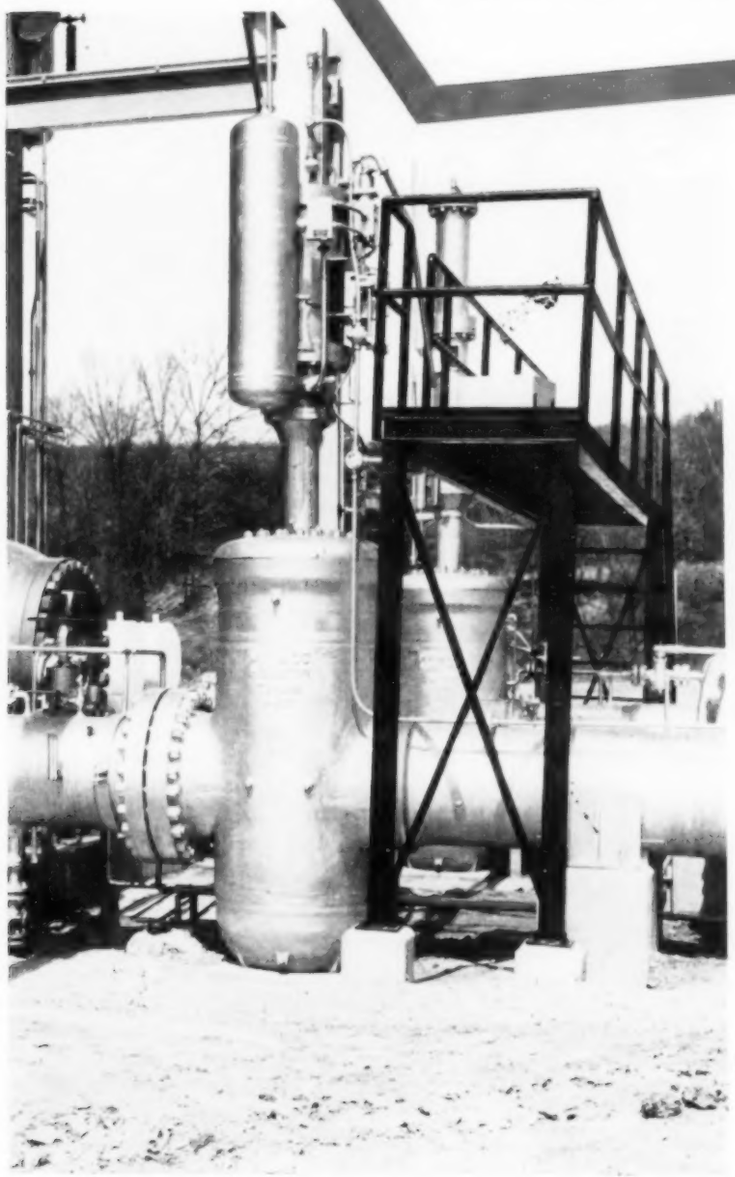
Proposed Pipe Line Construction—(Continued)

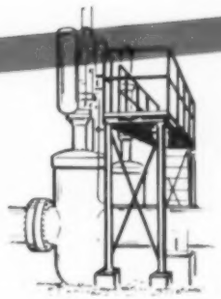
COMPANY	Length in Miles	Diameter	Type	Origin and Terminus	Estimated Cost	Status
Michigan-Wisconsin Pipe Line Co.—500 Griswold, Detroit	472	4-24	Gas	Main line loops and extensions in Wisconsin, Illinois	$17.6 million	Before FPC
	252	....	Gas	Loops in Missouri, Iowa, Wisconsin and Illinois	.....	Contracts let for 188 miles
Midwestern Gas Transmission Co., Houston, Texas	1112	....	Gas	Emerson, Manitoba—Nashville, Tenn.	$98 million	Before FPC
Montana-Dakota Utilities Co—Minneapolis	44	....	Gas	Various locations in S.D. and Wyoming	$1.4 million	Authorized
	41.8	12	Gas	Williams County, N.D.	$1.4 million	Authorized
	28	12	Gas	Fallon County to Dawson County, Mont. and compressor facilities	$776,280	Authorized
Mountain Fuel Supply Company	38	20	Gas	Parallel line and facilities to transport gas from Pacific Northwest line in Sweetwater County, Wyo.	.....	Authorized
NATO	1920	4-10	Products	To serve military bases in Western Europe	.....	Foster-Wheeler Prime Contractors, 1330 miles let
Natural Gas Pipe Line Co. of America—20 N. Wacker Dr., Chicago	350	20, 26	Gas	Wise County, Texas—Fritch, Texas	$28.5 million	Authorized
	25	....	Gas	Quinduno field in Roberts County, Texas	$3.2 million	Authorized
	480	30, 36	Gas	Loops at various points along existing line	$80 million	Before FPC
New York State Natural Gas Corp.	27	....	Gas	Elk County, Penn. to Lutherburg gas field in Clearfield, Jefferson and Indiana Counties, Penn.	$1.5 million	Authorized
North Carolina Natural Gas Corp.	575	3-16	Gas	Mooresville eastwardly across North Carolina	$13 million	Authorized
Northern Natural Gas Co.—2223 Dodge St., Omaha	167	24	Gas	Farmington, Minn. to Duluth, Minn. and Superior, Wis.	$12 million	Before FPC
	....	....	Gas	To interconnect with Natural Gas Pipe Line	$244,000	Planned
	28.4	30	Gas	Test lines to underground storage near Redfield, Iowa	$4.8 million	Authorized
	15	....	Gas	Loop line in Nebraska and install additional compressor horsepower in system in Texas, Kansas, Nebraska, Iowa	$4.7 million	Authorized
Northwest Pipeline Corp.	350	....	Crude & Products	Four Corners area to Salt Lake City, Utah	$15 million	Planned
Offshore Gathering Corp., Houston	364	24, 26, 30	Gas, Crude	Texas side of Sabine River 25 miles offshore La. to Mississippi side of Pearl River	$150 million	Planned
Pacific Gas & Electric Co.	150	34	Gas	Various loops, between Topock, Ariz.—Milpitas, Calif.	$20 million	85 miles let
	83	12, 18, 20	Gas	Glenn County areas to Sacramento region	$5 million	Planned
Pacific Northwest Pipe Line Corp.—Salt Lake City, Utah	1,487	22, 26	Gas	San Juan Basin—Pacific Northwestern states and Canadian border terminus near Sumas, Wash. plus 732 miles of supply and sales laterals	$246 million	Contracts let for main line and 477 miles of laterals
	50	46	Gas	To serve industrial customers at Uravan and Nucla, Colo.	$1 million	Authorized
Pembina Pipe Line, Ltd.	100	....	Crude	Gathering line and new pumping unit in West-Central Alberta	$4.5 million	Planned
Pennsylvania Gas Co.	38	8, 10	Gas	In Erie and Warren Counties, Penn., and Chautauqua County, N.Y.	$930,000	Before FPC
Petroargentina	370	16	Crude	Newguen—Bahia Blanca, Argentina	$40 million	Planned
Petroleos Mexicanos—Ave. Juarez, 94, Mexico City	440	20	Gas	Brazil—Tampico—Poza Rica, Mexico	.....	Planned
	145	12	Crude	18 de Marzo Field—Monterrey, Mexico	.....	Considered
	80	8	Products	Guaymas—Los Mochis	$1 million	Planned
Phillips Petroleum Co.—Bartlesville	54	6	Products	Goldsmith—Borger, Texas	.....	Planned
	22	20	Gas	Roberts County, Texas, to Rock Creek gasoline plant	.....	Approved
Piedmont Gas Co.—Hickory, N.C.	78	2-8	Gas	From connection with Transcontinental Gas Pipe Line to serve customers in North Carolina	$2.6 million	Before FPC
Royal Dutch Shell	700	30	Crude	Mediterranean Sea to North Sea ports	$280 million	Considered
Saskatchewan Power Corp.	80	....	Gas	Hatton gas field to Success, Sask.	.....	Planned
	40	....	Gas	Moose Jaw, Sask. to Regina, Sask.	.....	Planned
Sinclair Oil & Refining Co. and Socony Mobil Oil Co.	211	....	Crude	San Silvestre field, Barinas, Venezuela, to Puerto Cabello on Caribbean sea coast	$25 million	Planned
Sohio Petroleum Co.	37	8	Products	Mogadore to Girard, Ohio	.....	Planned
South Alberta Pipe Line, Ltd.	46	10	Gas	Etzikom Field—Medicine Hat, Alberta	$1 million	Planned
South Saskatchewan Pipe Line Company	58	12	Crude	Cantuar field to Dollard field, Saskatchewan	$3 million	Approved
Southern Calif. Gas Co. & Southern Counties Gas Co.	236	30	Gas	Topock, Ariz. to Newhall, Calif.	$26.9 million	Approved
	49	....	Gas	Newhall to Alhambra, Calif	$6.6 million	Contract let
Southern Natural Gas Company	52	....	Gas	Various locations in Ga. and La.	$2.2 million	Authorized
Southern Pacific Pipe Lines, Inc.	300	....	Products	From San Francisco Bay area to Reno—Fallon, Nev. area	$16 million	Planned
Stanmount Pipe Line Co.	140	10	Crude	Cayiga and Beaver Lake Fields, N.D. to connect with Interprovincial Pipe Line	.....	Planned
Sturgeon Pipe Line Ltd.	100	12	.....	Sturgeon Lake Field—Trans-Mountain system	$6,500,000	Planned
Sui Gas Transmission Company	200	16	Gas	Sui field in Pakistan to Multan in southern Punjab	.....	Planned
Sunflower Pipe Line Co.—Tulsa, Okla.	265	3-6	LPG	Kearny, Grant and Haskel Counties, Kansas—Wichita, Kansas	$3.5 million	Authorized
Tecumseh Pipeline Co.	....	20	Crude	To connect to principal crude line carriers in Chicago area for movement to east	.....	Planned
Tennessee Gas Transmission Co.—Box 2511, Houston (See also Midwestern Gas Transmission Co.)	100	....	Gas	Gathering lines in Texas and Louisiana plus station additions	$18.6 million	Before FPC
	162	26, 30	Gas	Loop Lines in Kentucky, Ohio, and Pennsylvania	$24.3 million	Authorized
Texas Eastern Transmission Corp.	422	30	Gas	McAllen to Vidor, Texas	Estimated	Before FPC
	530	30	Gas	Loops at various points between Kosciusko, Miss. and Uniontown, Penn.	Cost of Entire Project	Before FPC
	45	24	Gas	Provident City, Texas crossover to McAllen-Vidor line	$150 Million	Before FPC
	135			Supply and delivery lines laterals		Before FPC
Texas Illinois Natural Gas Pipeline Co.	59	36	Gas	Loops facilities in Illinois	$6.4 million	Before FPC
Texas Gas Transmission Corp.	198	20	Gas	East Lake Palourde Gas field, La. to Eunice, La. and loops paralleling existing system in Arkansas, Mississippi, Tennessee, Kentucky, Indiana	$20 million	Contract let
	40	6-30	Gas	Parallel lines and compressor additions on existing lines in Louisiana, Missouri, Mississippi, Illinois, Kentucky	$6 million	Authorized
Trans-Canada Pipe Line, Ltd.—Calgary, Alberta	2250	30, 36	Gas	Alberta—Eastern Canada	$378 million	Contracts let for 4 spreads
Trans Carolina Pipeline Co.	280	8-18	Gas	Transmission line and compressor facilities plus 567 miles of laterals in tidewater areas of North and South Carolina	$21.6 million	Before FPC
Transcontinental Gas Pipe Line Corp.—3100 Travis St., Houston	....	....	Gas	Connecting facilities with Texas Eastern Penn-Jersey in Pennsylvania and New Jersey	$131,628	Authorized
	24.2	....	Gas	Gathering Lines from South Bayou Mallet, Maxie and Happytown Fields, La.	$754,000	Authorized
	12	....	Gas	Live Oak gas field, Vermillion Parish, La. plus two meter stations	$707,000	Before FPC
	277	30, 36	Gas	In Louisiana, Mississippi, Alabama, Georgia, S. Carolina, N. Carolina, Virginia, Maryland, Pennsylvania	$42 million	Authorized
Union Oil Co. of Calif.—Los Angeles, Calif.	225	12, 16	Crude & Products	San Joaquin Valley to Union Oil's Oleum refinery on San Francisco Bay.	.....	Planned
United Natural Gas Co.	50	12	Gas	Elk County—Jefferson County, Pa.	.....	Planned
U. S. Navy	450	8	Gas	Gubik Field—Fairbanks, Alaska	$20 million	Planned
Washington Gas Light Co.—Washington, D.C.	28	20, 24	Gas	From metering station of Atlantic Seaboard Corp. to Washington to connect with line leading to District of Columbia facilities	$3.4 million	Authorized
Westcoast Transmission Company, Ltd.	270	8-26	Gas	Various locations in Peace River region	.....	Planned
Wilcox Trend Gathering System, Inc.	16	16	Gas	Gathering lines to Provident City, Texas	$2.9 million	Before FPC
Winnipeg and Central Gas Co.	450	4-8	LPG	Tioga, N.D.—Winnipeg, Canada	$20 million	Planned
YPF	808	....	Gas	Campo Duran, to Buenas Aires, Argentina	$76 million	Planned
	635	....	Crude	Campo Duran to San Lorenzo, Argentina	$24 million	Planned
	621	....	Crude	Mendoza to San Lorenzo, Argentina	$19 million	Planned

W-K-M *Dependability...*

VITAL IN GULF INTERSTATE'S FULLY AUTOMATIC COMPRESSOR STATION







Completely dependable valve operation is of the utmost importance in this remotely controlled, fully automatic compressor station. These valves, operated from a station 80 miles distant, must open or close at the push of a button. The parallel expanding gate in W-K-M valves is the best possible insurance for dependable operation. Before moving into open or closed position, the gate segments are positively contracted by the exclusive LEVERLOCK and held in this position, assuring free and easy movement of the gate. Expansion of the gate segments against both upstream and downstream seats provides a positive double seal. Their Through-Conduit provides full volume, free flow . . . offers no more pressure drop than an equivalent length of pipe . . . sets up no turbulence. The right ratio of port opening to closing speed prevents dangerous line surges.

For the ultimate in dependable performance with minimum maintenance all along the line, specify W-K-M Pipeline Valves. Write today for your copy of the new W-K-M Pipeline Valve Catalog 300.

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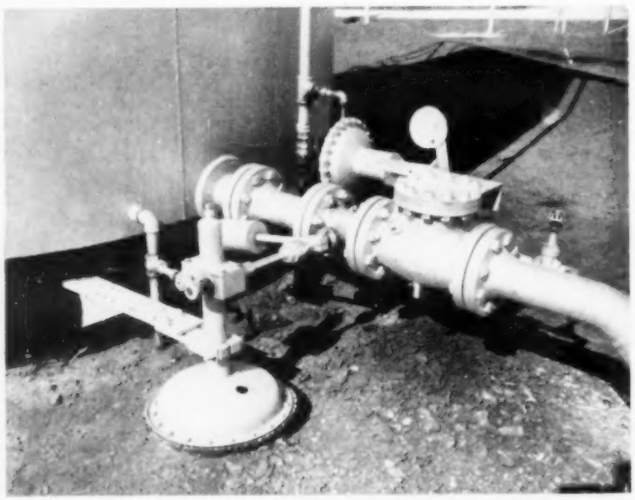


Valve Keeps Air Out of Line When Tank Level Drops

One pipeliner devised an automatic valve-closing mechanism that keeps air from passing into the main line from the surge tank when the tank level gets low.

The device, in the foreground of the picture on the left, consists of a diaphragm that moves up and down with liquid head pressure in the tank. An offset cylindrical weight holds the diaphragm in its downward position and keeps a line valve closed when the tank liquid level and head pressure are low.

When the head pressure is high, the diaphragm is forced up against the leverage of the weight to open the line valve and allow flow into the tank if line pressure is high, and flow out of the tank if line pressure is low. The diaphragm will always drop and close the valve before the tank liquid level gets down to the tank outlet.

Another diaphragm, at right angles to the ground, prevents overfilling the tank. When the tank level nears the overflow point, liquid passes into a header that connects to one side of the diaphragm. The head pressure developed in this header is sufficient to move the diaphragm, which in turn pushes against a weight (a metal disc) and closes a second valve in the line.

This valve-counterbalance arrangement is such as to hold this outlet valve open for both in and outward flow until pressure in the header neutralizes the weight and permits the valve to act as an ordinary outlet valve. Thus, with liquid in the header, flow can take place out of the tank but not into the tank. Oil in the header must be drained manually before two-way flow is again possible in the line.

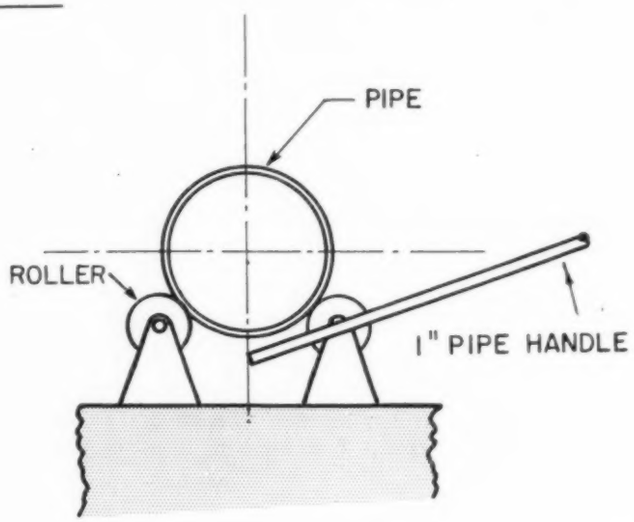
This delicate balance system of weights and diaphragms automatically keeps air out of the main line when the surge tank oil level is low and prevents oil flow into the tank when the overflow point is reached.

Roller Handles Simplify Pipe Handling on Yard Racks

At one pipe yard where pipeliners had to move several miles of small size pipe with crowbars from a welding rack to a degreasing station, installation of permanent roller handles greatly simplified the work.

Pipe rested on rollers during a double-jointing welding operation. For degreasing, the welders moved the pipe off the rollers with crowbars. This involved hazard and wasted motion, so a welder fabricated the permanent handles to the rollers for easier and safer transfer of the pipe to the degreasing rack.

Thirty-inch sections of one-inch pipe were used at both ends of the roller pins.

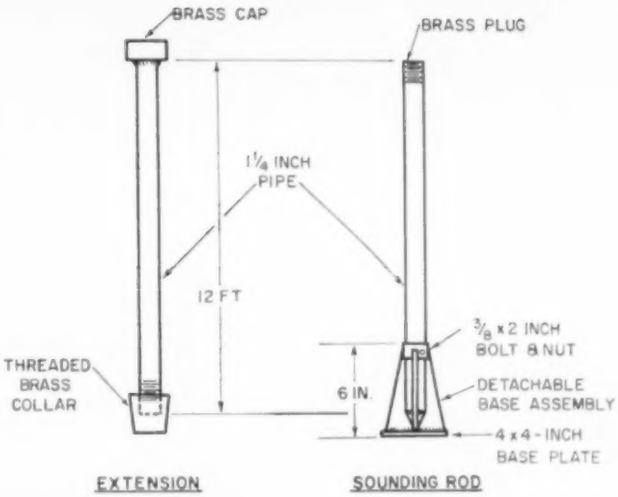


Aluminum Sounding Rod Is Handy Marsh Tool

Here's how one pipeliner built a rod for sounding bayous and canals from two 12-foot lengths of aluminum pipe. The sounding rod is light, can be adjusted to length, and floats.

To make it, fit a 1¼-inch pipe with a brass plug in the upper end as shown. The lower end is then cut and welded into a point. A steel or brass plate, four-inch by four-inch, and four braces of the same material form an end assembly that can be clamped to the pointed end of the rod for use at locations where the pipe is not buried. This provides a large surface for probing in water and prevents pipe coating from being chipped. Where pipe is buried, the plate is removed and the pointed end of the rod is used.

The upper end of the aluminum pipe is threaded for mating with an extension member of equal length. This extension rod is also of 1¼-inch pipe, threaded on the lower end, and fitted with a brass collar for connecting it to the probe rod. The other end is fitted with a brass cap so that the assembled rod will float in deep water.



Make Field Line-Up Clamp From Turnbuckle and Wedge

Line-up and welding of short lengths of big-inch pipe for field repairs or station work may be made easier and quicker with the turnbuckle-wedge arrangement shown. It is especially handy if the line-up clamp is not available.

To fabricate, short lengths of half-inch plate are welded to the ends of a half-inch turnbuckle. The lengths of pipe are lined up roughly and the turnbuckle is tack-welded to them as shown on the side of the joint where the largest gap occurs. Tightening the turnbuckle closes the gap.

A small L-shaped plate is tack-welded to one section of pipe so that it overhangs the other joint. This plate is located where the maximum lateral misalignment occurs. By driving wedges under the overhanging plate, the lateral gap is closed and the proper line-up is made.

Trap Injects Inhibitor In Engine Cooling System

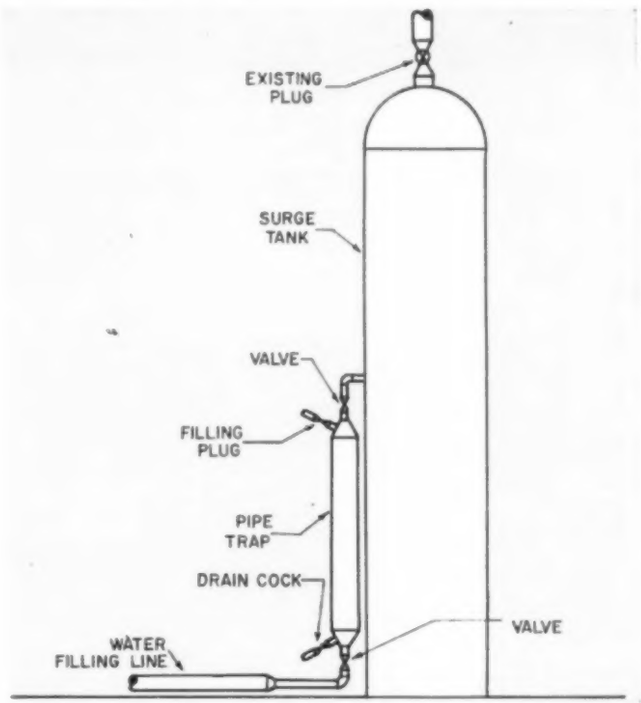
Here is how one station operator solved the problem of climbing to the top of a ten-foot surge tank to add rust inhibitor to engine cooling systems. A three-foot trap was added to the system so that chemicals could be added at floor level.

The trap is made of scrap two-inch pipe with one-half-inch reducers welded to each end as shown. A filling plug and valve on the top and a drain cock and valve on the bottom complete the additions to the water-filling line.

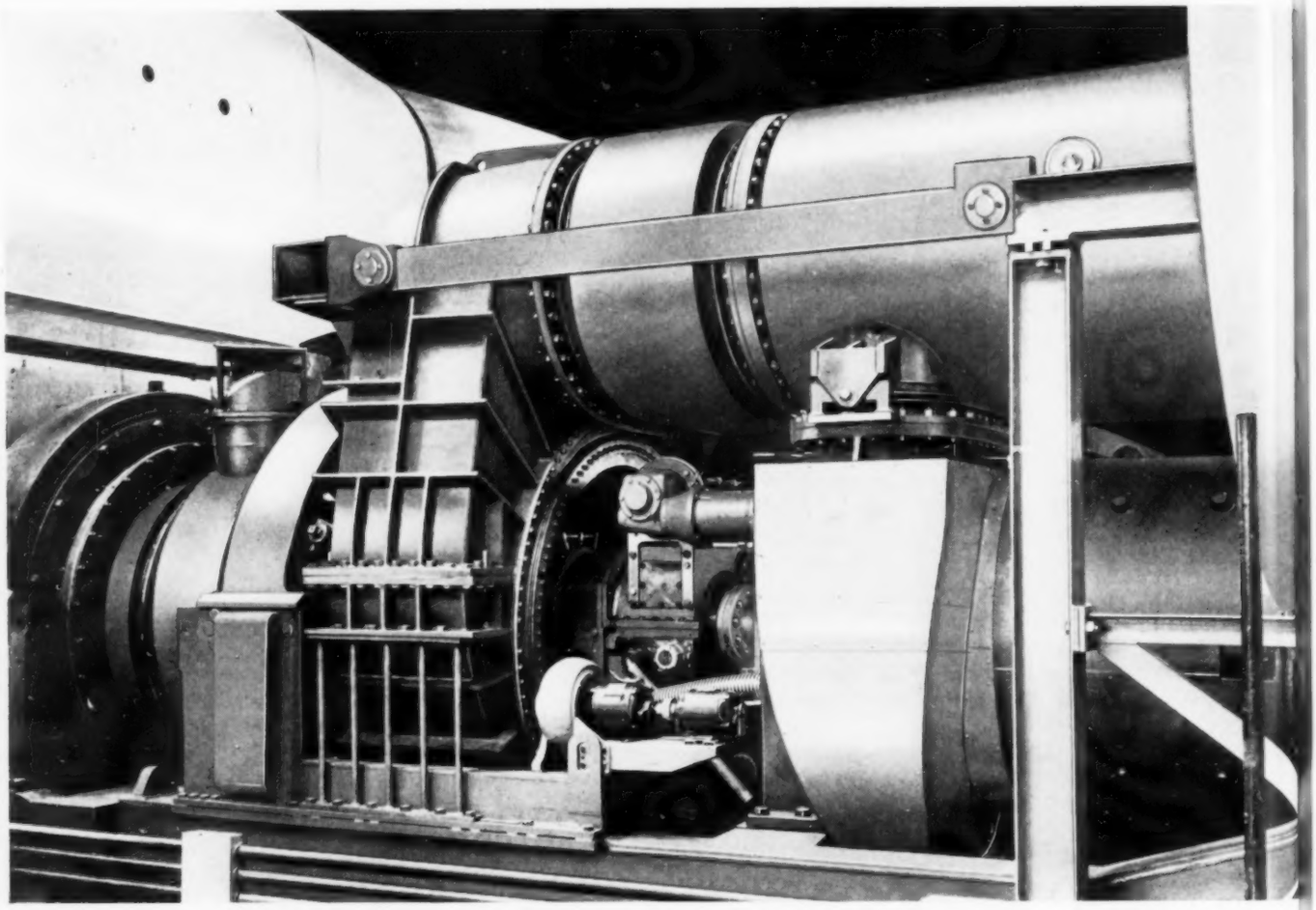
This apparatus greatly simplifies the addition of inhibitor to the system. First the two valves are closed. Water in the trap is drained out through the drain cock and inhibitor added at the filling plug. When the valves are reopened, the inhibitor is forced into the surge tank by the water line pressure.

On this system, one trap was used to circulate the chemical through four engines.

The trap enabled the operator to inject inhibitor into the surge tanks from the ground level rather than having to climb to the top of the tank.



GAS TURBINES



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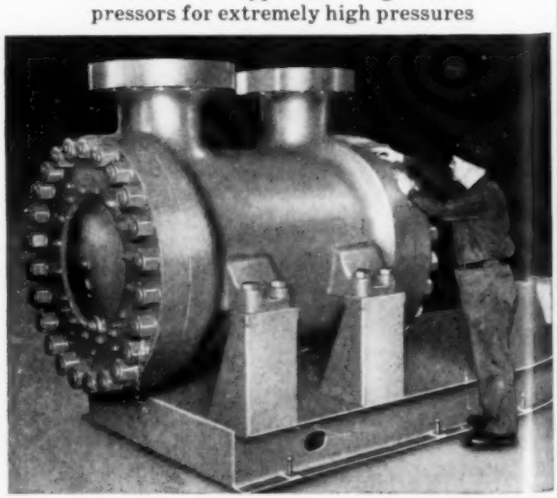

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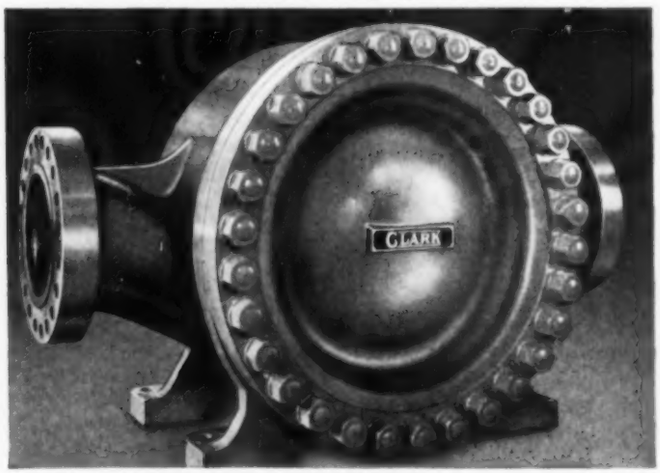
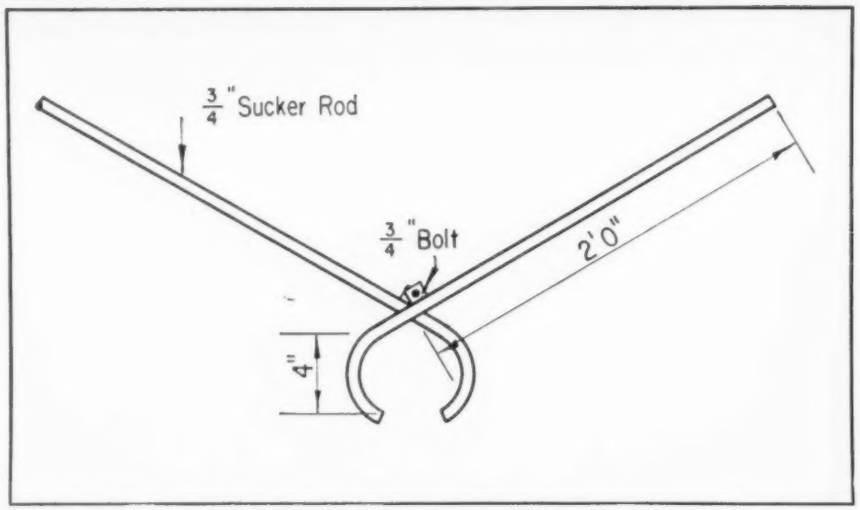


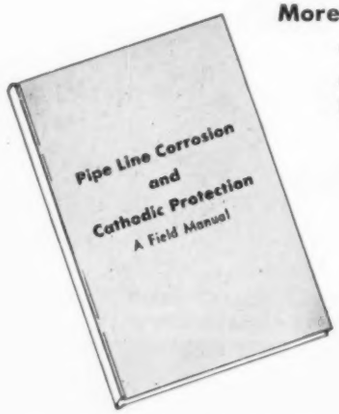


Make Small Pipe Carrier from Scrap

Moving and carrying small diameter pipe by hand is tiresome and slips can cause injuries to workers. These inexpensive pipe carriers made from scrap have been a big help in handling pipe up to four inches in diameter.

Two pieces of steel rod are used. One end of each piece is heated and bent on a four-inch diameter as shown. A ¾-inch nut is welded to each rod just above the bend. The two rods are fastened together by inserting a small rod through the nuts and peening the ends to that it cannot be removed. This small rod should have a diameter somewhat less than the minor diameter of the nut threads.

The resulting pipe carrier is simple but effective. Pipe sizes up to four inches can be carried by four men without the danger of pipe slippage.



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"... a most practical on-the-job manual for men concerned with pipe line corrosion. We are ordering copies for each of our district engineers."

Pipe Line Corrosion and Cathodic Protection

By MARSHALL E. PARKER

This Handbook, written by Marshall E. Parker, consultant, is designed as a practical field manual. It is a 108-page pocket-size volume printed first as a popular series in WORLD OIL. The Handbook is illustrated with many charts and drawings and is completely indexed by subjects.

It presents comprehensive data on Soil Resistivity Surveys, Potential Surveys, Line Currents, Current Requirements, Rectifier Systems, Ground Bed Design, Magnesium Anodes, Stray Current Electrolysis, Interference in Protective Systems, Operations and Maintenance, and Coating Protection and Testing.

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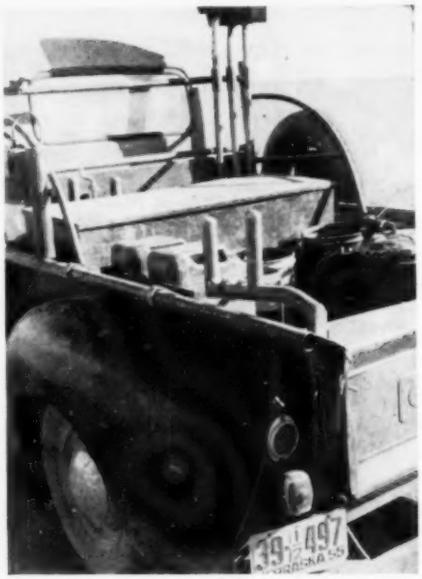
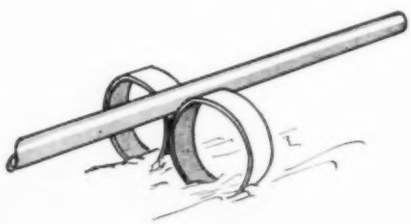


Sturdy, Movable Rack Aids Pipe Hauling

A light, sturdy, all-welded pipe rack, adaptable to any pickup truck, is a handy addition to the pipe line maintenance truck. The unit, designed with a square post to fit in the truck post socket, can be installed in an outward position for hauling, or rotated 90 degrees as shown when not in service. Two short lengths of split 2-inch pipe are welded between the two uprights to prevent pipe from rolling.



Support Small Field Pipe On Welded Pipe Rings

Here is a good way to hold small diameter pipe off the ground while welding or coating in the field.

Make the ring "skids" by cutting and welding together two rings of large diameter pipe as shown. A supply of these racks can be made quickly between jobs and can come in handy during field work.

By choosing the right diameter pipe, height of the line being held can be regulated as desired.

MALONEY INSULATORS for any job

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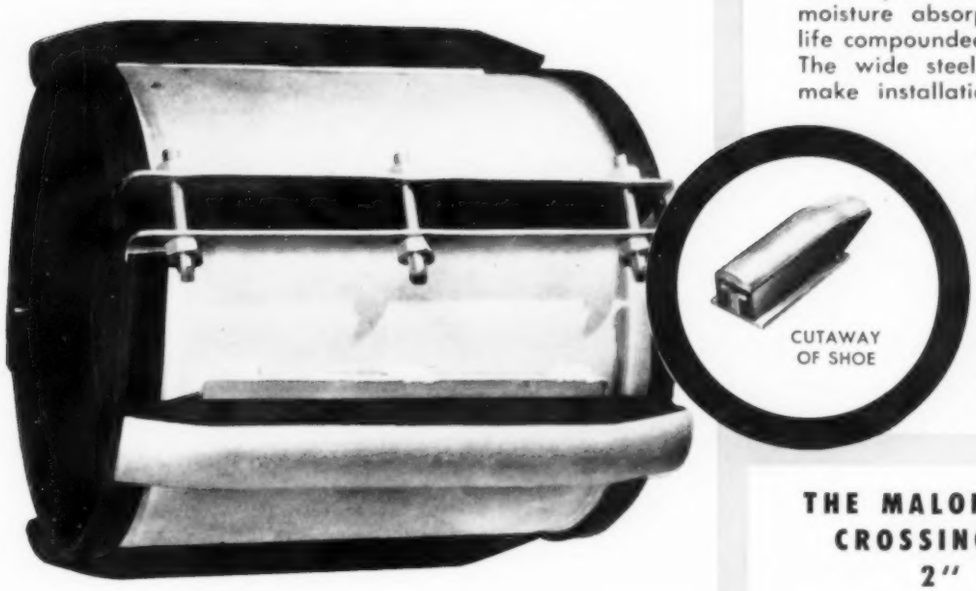
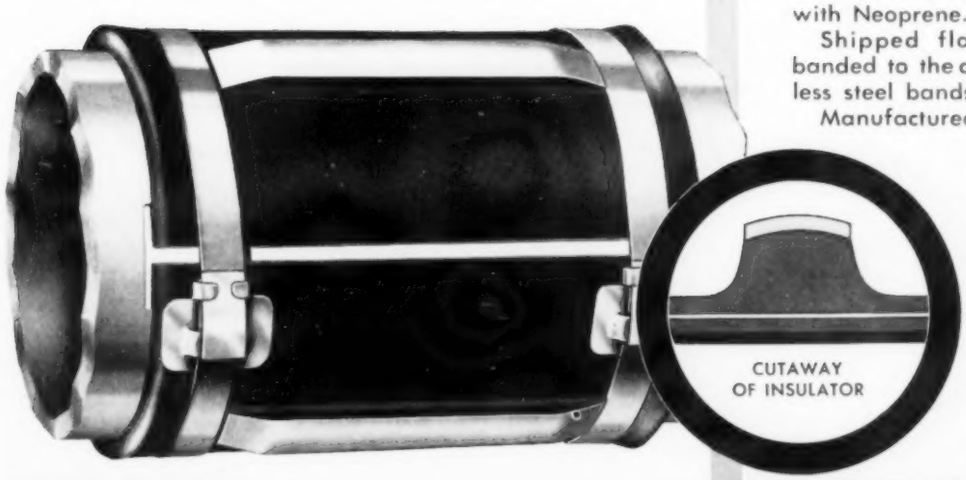


THE MALONEY MODEL 55 CROSSING INSULATOR FOR ALL SIZES OF PIPE

These insulators have superior insulation qualities because of the low moisture absorption and the long life compounded into the Neoprene. The wide steel, sled type runners make installation easy. The extra wide band affords a positive grip.

Bonded metal-to-Neoprene-to-metal, the runner insulates and also permits flexibility to compensate for pipe shifting and acts as a shock absorber to prevent damage due to sudden heavy loads.

or small



THE MALONEY MODEL 56 CROSSING INSULATOR 2" TO 12"

Manufactured with Neoprene, which is vulcanized to steel band core and to the rounded steel runners, there is no place to "short-out" between the casing and the carrier line. The steel core is completely surrounded with Neoprene.

Shipped flat, the Insulator is banded to the carrier pipe with stainless steel bands.

Manufactured in sizes from 2" thru 12", it can be used either on installations where there is only one nominal pipe size difference or on installations having a larger differential.

This is the Insulator designed and manufactured to give you the best job at a competitive price.

SINCE 1932—
PRECISION IN RUBBER—
METAL—PLASTICS

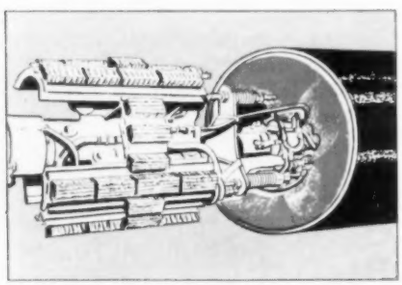
"Something from the Irishman"

F. H. MALONEY *Company*

2301 TEXAS AVE. • FA 3-3161 • HOUSTON

For more data on advertised products, use Readers' Service Cards, last page.

Copon internal pipe coating selected again by major gas transmission company



Thirty and thirty-six inch pipe being automatically spray-painted at mill following unique metal cleaning process.

Proof of COPON'S effectiveness in solving internal pipe coating problems lies in its growing acceptance by major gas transmission companies. This year it's being used again by one leading firm for new 30″ and 36″ pipeline construction in addition to many other projects.

COPON internal pipe coatings offer *even more* than outstanding protection against corrosion losses. They *pay off* in protection during storage, lowered maintenance expense and greatly reduced pigging costs. And COPON coatings make possible delivery of cleaner, rust-free gas products.

Scientifically developed systems are available for coating dehydrated gas lines, crude and petroleum product lines, salt water lines, fresh water lines, and oil well tubing and casing. Write your nearest COPON manufacturer today. He will be happy to show you how COPON can be efficiently applied to new pipe, used pipe or pipe-in-ground.

Get complete information about COPON today.

MAIL COUPON TODAY PLI-8

Please send me information about COPON Internal Pipe Coatings.

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Company_____

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P. O. Box 546, Denver 1, Colo.

JAMES B. SIPE and COMPANY, INC.
P. O. Box 8010, Pittsburgh 16, Pa.

Scrap Pipe Protects Plastic Line

A few joints of scrap 6-inch pipe make an effective casing for plastic pipe lines at a creek bed crossing. The welded section shown will facilitate the crossing and shield the plastic from damage after the crossing is effected.

The design shown allows the attachment of a cable for sliding the entire length into position. An elbow on each end of the plastic pipe keeps it relatively secure inside the 6-inch casing. After the unit is in place, it may be attached at both ends and the plastic line continued.

Back Pressure Regulator Doubles as Relief Valve

One gas pipeliner devised a workable relief valve by fitting a second pressure regulator into an above ground regulator setting as shown. The original regulator, a spring-loaded diaphragm type, fits in a vertical position and opens to flow as the line pressure increases.

The second regulator, shown attached in a horizontal position on the low pressure side of the first regulator, does not affect line throughput. It opens to the atmosphere when the line pressure rises too high, thus serving as an adequate relief valve.

A tee, two nipples and two ells are all that are necessary to tie the second regulator into the system.

Shack Makes Firewall At Field Pump Station

Fire hazards are reduced by building a shack to separate the engine from the high pressure pump at skid-mounted field pump stations. If a pump cylinder or fitting should rupture, oil would not reach the exhaust or ignition system of the engine to cause fire. The shed also protects the engine and accessories from weather.

The house is built after the skid-mounted engine has been set and inlet and discharge connections made. In effect, it forms a firewall between the engine and pump.

for Superior Lubrication
PIPELINERS PICK
LE #1020
HIGH TEMPERATURE LUBRICANT
and L-X
FUEL AND OIL SUPPLEMENT

Because LE lubricants give results — not promises, they are the pipeliner's pick for superior lubrication. LE's fast-growing reputation for top-notch on the job performance is the talk of the pipeline industry.

#1020
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Built to "take it" on tough pipeline jobs! Scientifically manufactured from carefully selected high quality ingredients and blending oils. LE 1020 "stays put" and protects expensive pipeline equipment. High temperature, pressure and rock-crushing vibration often mean "sudden death" to ordinary greases— but for the lubricant that will outlast and outperform— pick LE 1020.

L-X
FUEL AND OIL SUPPLEMENT
Here's the only fuel and oil supplement engineered for heavy duty engines. Penetrating the pores of the metal, L-X cleans deposits of gum, carbon, varnish and lacquer from valves and rings. Its use means fewer break-downs and repairs— plus more pep and power. Use L-X in your pipeline power units!

WHEN THE JOB CALLS FOR
"FULL SPEED AHEAD"
PIPELINERS PICK LE.

For further information on this or other LE lubricants, write, wire or phone

INDUSTRIAL LUBRICANTS
FOR INDUSTRIAL EQUIPMENT
LUBRICATION ENGINEERS, INC.
FORT WORTH, TEXAS

"An Ounce of Prevention . . ."

S&J

Whether or not to provide that "ounce of prevention" is very often a matter of considering the cost, but when you find a SAFETY DEVICE which is LISTED by Underwriters Laboratories, and which gives you a more favorable insurance rating, the device may actually pay its own way. It is quite possible that the added protection of S&J Flame Arresters may cost you absolutely nothing.

Model ST-863, illustrated here, combines a positive fire stop with maximum flow capacity. A tube bank of pure aluminum, with tubes running parallel to the direction of flow, is carefully fitted in the enlarged diameter of the body casting, using an aluminum casing that is faced and ground, assuring a tight seat. Explosive violence will not force a flame through the tube bank.

For maximum safety, S&J Flame Arresters should always be installed in conjunction with conservation, and safety relief valves. As Model ST-863 they are available in 2", 3", 4", 6", 8", 10" and 12" sizes in all aluminum. A choice of metal specifications is available in Model ST-4300. Why not explore the possibilities of their generous use?

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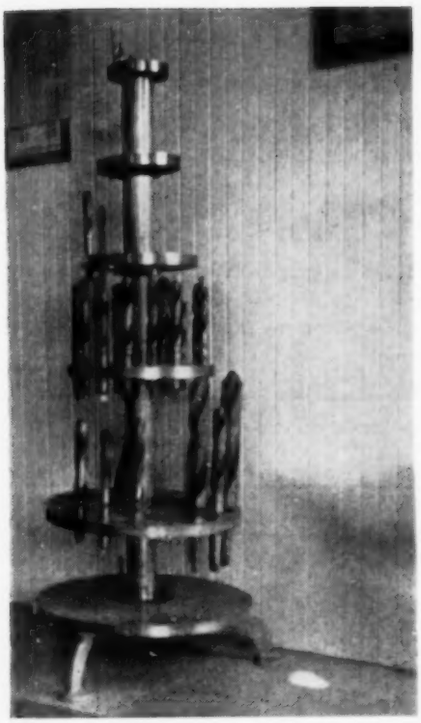
CARACAS: Sinclair Spence, C.A., Edificio Galipan
ENGLAND: Whessoe, Ltd., Sales: 25 Victoria St., London S. W. 1
Whessoe, Ltd., Works: Darlington, County Durham



Bit Rack Facilitates Fast Drill Selection

Provide a quick way to select bits with this handy rack in the station shop. It can be made from scrap rod on strips and an assortment of circular plates fitted to piston rods.

Drill holes around the circumference of the plates, making them slightly larger than the shanks of the bits they are to hold. Then stamp the bit size on the front of the plate.

Set the plates down on an offset in the piston rods. In this way, the bits can be swung around to the front for quick selection.

How-To-Do-It Ideas

Earn Money, too!

$10—PLI editors want how-to-do-it ideas, so your favorite short cut or invention could put money in your pocket! Write down the substance of that latest idea and send it in with a picture or drawing of the installation . . . if accepted, $10 will be yours. Send those money-making ideas today to Hints Editor, Pipe Line Industry, P. O. Box 2608, Houston 1, Texas.

QUALITY CONTROLLED in every step of manufacture . . .

LONE STAR
API LINE PIPE

From mining of raw materials through the finishing operations in Lone Star's ultra modern pipe mills . . Lone Star line pipe quality is controlled every step of the way.

Lone Star Steel is a completely integrated operation . . primarily dedicated to serving the teeming Mid-Continent area. Lone Star, however, furnishes hundreds of miles of line pipe for distant projects such as the great Pacific Northwest pipe line. Lone Star pipe bends readily, wall thickness is uniform, and long lengths and weldability speed up construction.

Neighbor, wherever you are, specify Lone Star and we both get a good deal.

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Pipe Line Men

IN THE NEWS

H. A. Rhodes, superintendent of communications at **Transcontinental Gas Pipe Line Corporation, has been** elected president of the Petroleum Industry Electrical Association. Rhodes was an electrical engineer with Humble Pipe Line Company in the Communications and Electrical department for many years before joining Fish Constructors as superintendent of communications and cathodic protection. He joined Transcontinental as superintendent of communications in 1950.

H. A. Rhodes

•

Industry coordinators for the API Division of Transportation School of Pipe Line Technology have been appointed. Each coordinator will secure instructors and arrange curriculum for one week of the school in October at Lee College, Beaumont. They include **R. L. Carruthers,** Shell Pipe Line Company, Houston; **Morgan Martin,** Pipe Line division of Gulf Refining Company, Houston; **R. A. Brannon,** Humble Pipe Line Company, Houston; **Roy Olbrich,** Texas Pipe Line Company, Houston; **Larry Patterson,** Sohio Pipe Line Company, St. Louis; and **W. G. Horstman,** Plantation Pipe Line Company, Atlanta.

•

J. C. Cross, vice president of **Hope Natural Gas Company** and director of both Hope and **River Gas Company,** has retired after 47 years of service. He has served in many capacities since starting to work in the oil fields in 1904. Among his positions with Hope have been field accounting supervisor, assistant chief accountant, chief accountant, assistant treasurer and treasurer.

Evan F. Walker

Paul C. Nail

Arthur R. Bullard

Charles Jackson

Walker and Associates, Incorporated, a consulting engineering firm, has moved into new offices in the Southern States Life Insurance building in Houston. The firm will serve the specialized fields of industrial, mechanical and electrical engineering design and drafting on a consulting basis. President is **Evan F. Walker** and other charter members of the firm are **Paul C. Nail,** vice president; **Arthur R. Bullard,** vice president; and **Charles N. Jackson,** secretary and treasurer.

Walker formerly was associated with the Fluor Corporation, Fish Engineering, Stone and Webster, United Gas, Magnolia Petroleum Company, and also was associate and manager of the Industrial Department of D. S. Cooper and Associates, consulting engineers.

Nail has been engaged in designing and engineering mechanical and electrical facilities for commercial buildings the past eight years in South Texas and Gulf Coast areas. Bullard and Jackson have been connected with various engineering concerns such as Fish Engineering, Brown and Root, and Strammler and Miller in engineering design and drafting for the petrochemical and pipe line industry.

The staff and facilities are available to serve the petrochemical and pipe line industry in the engineering and drafting of pipe lines, compressor stations, mechanical and refinery process piping, instrumentation and other technical phases. The commercial department is staffed with engineers specializing in design of air conditioning, heating, plumbing, lighting and electrical distribution systems in commercial buildings.

•

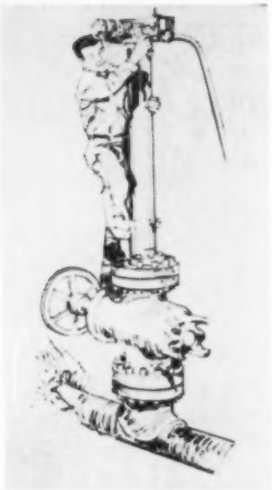
E. W. Corrin, a vice president of **Hope Natural Gas Company,** has been promoted to executive vice president; **G. W. McKinley** has been elected vice president—engineering and **J. P. Sole,** advanced to executive assistant.

Corrin, who started to work for Hope in 1933, became superintendent of right-of-way (long lines) in 1941. After Navy duty, he returned to the Legal department and was appointed system gas dispatcher for Consolidated Natural Gas Company, the parent company. He returned to Hope in 1951 and became vice president in charge of Gas Supply and Control and was elected to the board of directors. McKinley, who has been with Hope since 1933, has been chief engineer since 1947. Since joining the firm he has served at various field locations, was in charge of construction work at Bridgeport Station, and in charge of experimental engineering design work. He became division engineer in charge of mechanical engineering in 1944, serving until his promotion in 1947. Sole has been serving as assistant to the general superintendent since 1946. Sole began working for Hope in 1919 as a laborer and later held various clerical positions. He became field accounting supervisor in 1939.

Do You Know

What Topaz Can Do For You?

Topaz is a sales and service organization offering you complete lines of nationally recognized pipeline supplies and equipment plus the consulting and supervisory services of experienced engineers. You can call Topaz night or day, with assurance that your needs will receive prompt personal attention.



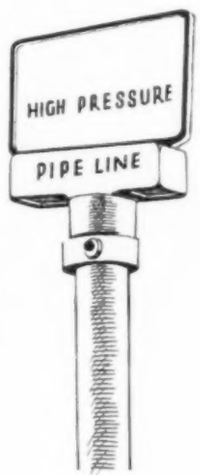
Hot Tapping

Topaz* sales engineers plan and supervise** hot tapping operations on gas, steam, water, products and chemical lines without costly shutdown. Hot tapping equipment may be contracted, leased or purchased. Topaz service includes consultation, supervision and instruction of company field personnel on use of purchased equipment.

Agent for T. D. Williamson, Inc.
***In Cooperation with T. D. Williamson, Inc.*

L & M Marker-Vents

L & M Marker-vents on highway and railroad casing vent pipes have proved both effective and economical. Less expensive than a field-welded vent hood, the aluminum alloy L & M Marker-vent will last the life of the line. Custom designed sign panels with your company name and emblem are available in your choice of colors. Sizes available for 2", 3" and 4" pipe. L & M products, distributed by Topaz* also include standard safety signs, well markers and aerial view markers.



Sole distributor for L & M products.

Consulting, Engineering and Supervision

Working in cooperation with engineering departments, Topaz sales engineers perform flow condition analyses, pigging, stopple application, inspection and line testing. All equipment for these operations may be leased, contracted or purchased through Topaz.

Cathodic Protection

All cathodic protection equipment and supplies, including rectifiers, anodes, coke breeze, pipe wrap and pipe coatings are available from one supplier . . . Topaz*. This means savings to you in time and paper work.

Agent for The Holcombe Co., Inc.

Other supplies available from Topaz:

- valves
- pipe cutting machines
- cutting and beveling machines
- odorizers
- clamps, hooks and dollies
- pipe saddles and reducers
- heavy machines
- torches
- Plus all other equipment or supplies necessary to complete your project.

Tod Pazdral *Pipeline Specialties*

ToPaz

2525 South Boulevard Houston, Texas Office Phone: JA 2-1403
Tod Pazdral Consulting and Supervision Home Phone: MA 3-5680

Lone Star Gas Company has announced the advancement of three Dallas men in the General Division of Distribution. **H. D. Portwood** has been named to the newly-created position of assistant to the vice president, **M. L. Bird,** whom he will assist with administrative work and operation of four regional areas in Texas and Oklahoma. **R. E. Reading** succeeds Portwood as superintendent of distribution for General division and **Louis B. Hulcy** replaces Reading as chief engineer for the division. Hulcy formerly was control engineer.

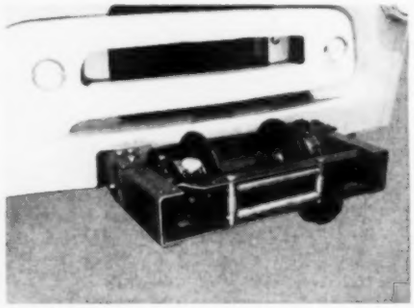
•

Thomas C. Bain, former **Lone Star Gas Company** industrial engineer, has returned to the company after five years in Caracas, Venezuela, where he was chief promotion engineer for the Venezuelan Atlantic Transmission Corporation. Bain will fill a newly-created position of industrial air conditioning specialist in Lone Star's Sales and Promotion department and will have headquarters in Dallas.

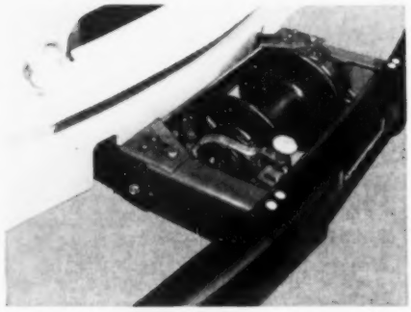
And *NOW* . . . it's the *NEW* BRADEN MU3-2 Winch Kit

for the New International S-120, 4 x 4

1 **Remove bumper of truck.**



2 **Assemble and mount winch.**



3 **Cut out center part of bumper. Mount bumper on winch frame.**

Kit contains a 6,000 pound capacity MU3 Braden Winch, PTO (For Warner "T9" Special Transmission) and all parts necessary for mounting on front of IHC S-120, 1956 truck. Can be mounted, ready for use, in about four man-hours.

Write to the Factory today for complete information, dimensional drawing, and installation instructions.

See Your Nearest BRADEN Dealer

BRADEN WINCH COMPANY
P.O. Box 547, Broken Arrow, Oklahoma

BRADEN *Winches*

"IN SERVICE AROUND THE WORLD"

D. C. Benson

W. A. Johnson, Jr.

C. W. Brown

James W. Carneal

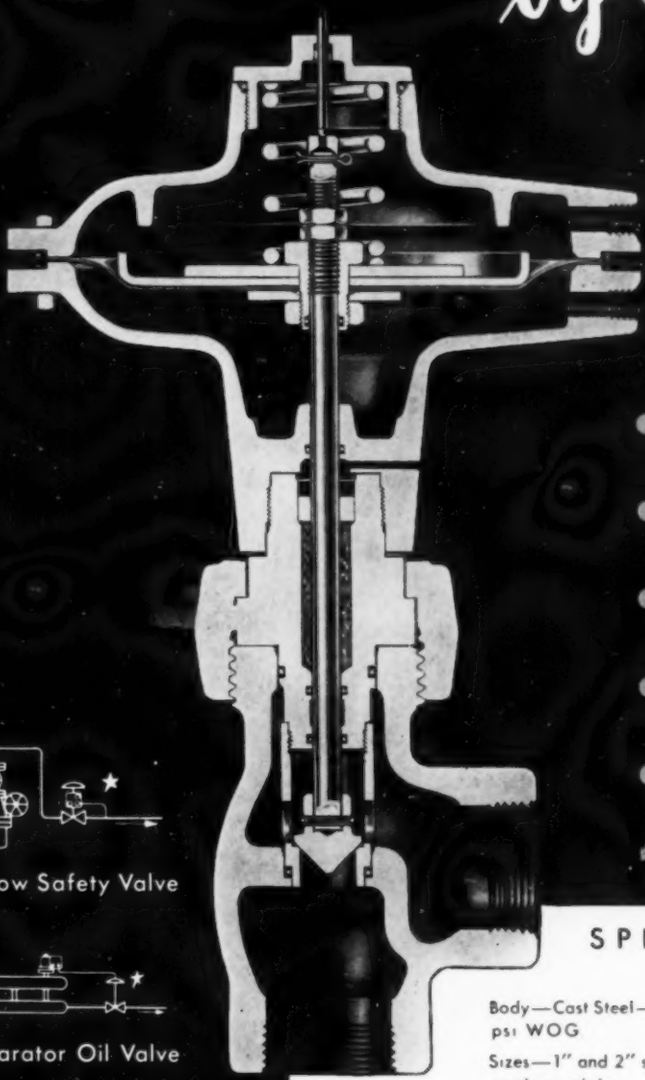
Texas Gas Transmission Corporation has announced promotions for four management employes at the firm's general offices. **D. C. Benson** is promoted from superintendent of measurement and research to director of planning and research; **W. A. Johnson, Jr.,** from superintendent of the Pipe Line department to general superintendent; **Charles W. Brown** from assistant superintendent of gas measurement to superintendent of that department; and **James W. Carneal,** from industrial representative in sales and customer relations to assistant director of sales and customer relations.

Benson has been with Texas Gas and a predecessor company, Kentucky Natural Gas Corporation, 22 years. He will be responsible for engineering planning and research on technical problems and will continue his responsibilities concerning the direction of Texas Gas' underground storage program as well as preparation of economic studies, pipe line design, flow studies and engineering studies and exhibits. Johnson succeeds **A. L. Roberts,** recently elevated to vice president.

Johnson continues temporarily to function as head of the Pipe Line department and will have over-all charge of operations in Texas Gas' Louisiana division, Gas Measurement department and Dispatching department.

Brown, a Texas Gas man since

A New FIELD VALVE by FISHER®



Series 125P

HIGH PRESSURE DIAPHRAGM CONTROL VALVE

- RUGGED CAST STEEL BODY GOOD FOR 2000 psi PRESSURE
- ONE INNER VALVE FITS ALL ORIFICES
- TOPWORKS INTERCHANGEABLE ON ALL BODIES
- DIAPHRAGM CASINGS SUITABLE FOR 50 psi OPERATING PRESSURE
- TOPWORK ACTION REVERSIBLE WITH NO ADDITIONAL PARTS

WRITE FOR BULLETIN O-125P

Hi-Low Safety Valve

Separator Oil Valve

Time Cycle Intermitter

SPECIFICATIONS

Body—Cast Steel—2000 psi WOG

Sizes—1" and 2" screwed angle or globe

Orifice Size—1" Body—¼", ⅜", ½", ¾" 2" Body—¼", ⅜", ½", ¾", 1"

Valve Cage—440 hardened St. Steel. (Tungsten carbide insert also available.)

Inner Valve—440 hardened St Steel (Tungsten carbide tip also available.)

FISHER GOVERNOR COMPANY

MARSHALLTOWN, IOWA · WOODSTOCK, ONTARIO

LEADS THE INDUSTRY IN RESEARCH FOR BETTER PRESSURE AND LIQUID LEVEL CONTROL

FISHER Since 1880

For more data on advertised products, use Readers' Service Cards, last page.

1949, has been assistant superintendent of gas measurement. Carneal, a Texas Gas man since 1949, will continue the work he has done in the industrial development field and will assist in the various functions of sales and customer relations.

•

R. W. Palmer, chief dispatcher in the Pipe Line department of General Petroleum Corporation in Los Angeles has been elected president of the Petroleum Pipe Line Chief Dispatchers Organization. Other officers are **D. J. Cameron,** Shell Oil Company, vice president; and **G. L. Brown,** Richfield Oil Company, secretary-treasurer.

•

William W. Richardson and **Warren M. Albert** have been named assistant comptrollers of **Socony Mobil Oil Company, Inc.** Richardson has been with the company for eight years and has been secretary of the coordination committee. Albert comes from Magnolia Petroleum Company in Dallas, Socony Mobil's Southwest affiliate. Albert has been with Magnolia 28 years.

John Davis

Frank Lindquist

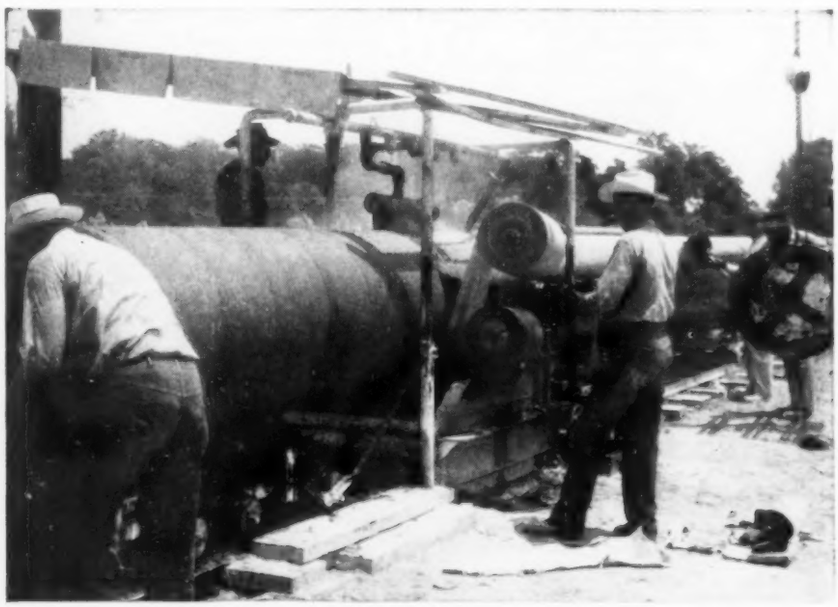
Northern Natural Gas Company has announced transfers and promotions involving **John Davis, Frank Lindquist,** and **Les Richardson.** Davis, formerly in the Engineering department, has been transferred to the Pipe Line department to serve as technical assistant. His work will be directly associated with regular station design changes, sizing gas regulators and cleaners, hydrostatic testing of pipe lines, well dehydration and other technical assignments. Lindquist, engineer, has been promoted within the Engineering department and Richardson has been promoted from acting chief pilot to chief pilot.

Les Richardson

Davis began working for Northern in 1950 as an engineering aide in the Omaha field engineering section. Since then he served in the capacities of party chief, division engineer and junior engineer in the Engineering department. Lindquist has been in the Engineering department since 1942 when he began with the company as a field draftsman. Richardson came to Northern in August, 1955 from Meredith Publishing Company, Des Moines, where he had been a pilot. Formerly he was with Ruan Transport Service and served five years in the Army Air Corps Air Transport Command.

•

Mid-Valley Pipeline Company has announced three personnel promotions. **James P. McClurkin** has been named assistant to the general superintendent; **Jack D. Davis** named station foreman at Mid-Valley's new Benton, La., pump station, and **Robert R. Tumbleson,** station foreman at Abbeville pump station in Oxford.



Lay Pipelines Faster with

RUBEROID LIGHTWEIGHT IMPERIAL

Glass Fiber Reinforced Asbestos Pipeline Felt

Ruberoid's new Lightweight Imperial Pipeline Felt—reinforced with glass threads—is thinner, lighter, easier to handle. With more felt coverage per roll there are fewer machine stoppages for loading. Lightweight Imperial means a faster job from start to finish.

Because of the tough but light glass threads that are added to it, Lightweight Imperial has a greater tensile strength per pound than ordinary felt. And most important of all it's lower in cost.

For extra savings in wrapping pipelines, investigate the lower cost, easier handling, greater strength and faster application of Ruberoid Lightweight Imperial Glass Fiber Reinforced Asbestos Pipeline Felt.

National Distributors:
S. D. DAY COMPANY
Bayou Building
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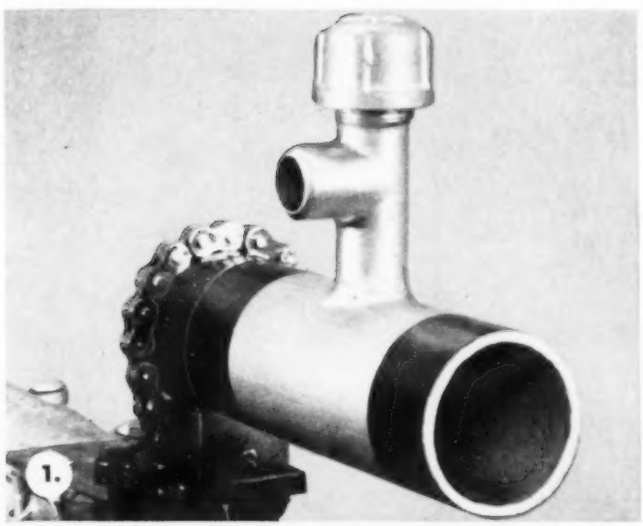
"Serving All Pipelines"

The RUBEROID Co.

ASPHALT AND ASBESTOS BUILDING MATERIALS

New from Polyken

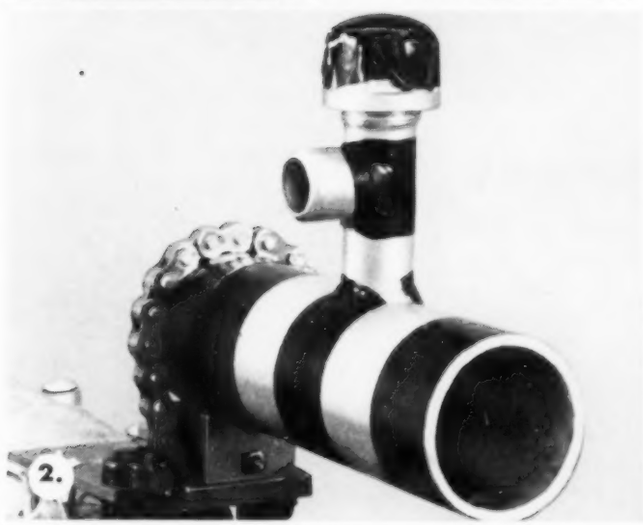
The tape that fits to a "T"



A remarkable ability to conform to irregularly shaped contours . . . plus all the advantages of polyethylene

(another example of
"CONTROLLED STRENGTH"
in Polyken protective coatings)

Three easy steps in wrapping a T-joint with *Polyken* Polyethylene Tape No. 940. Note the way this highly conformable tape adapts itself to every twist and turn.



If you have pipe contour problems, this one's for you. Where you need it, it's a valuable new companion product to *Polyken* No. 900 polyethylene tape coating—the ideal coating for straight-pipe runs.

***Polyken* No. 940**—is made especially for use on valves, fittings, ells, T-joints and other irregularly shaped pipe connections. All the superb corrosion resistance of polyethylene . . . plus an extremely high degree of conformability.

No. 940 is a truly balanced product which offers the right combination of elastic memory and dead stretch. Financially, it can mean a nice saving on maintenance.

We'll be glad to figure application costs on your job. Write, wire or phone today: The Kendall Company, Polyken Sales Division, Dept. PL-H, 222 West Adams Street, Chicago 6, Illinois (RAndolph 6-4250).

Complete catalog, Sweet's Industrial Construction File, Sec. 6c/Ke

Polyken®

CONTROLLED STRENGTH

PROTECTIVE COATINGS

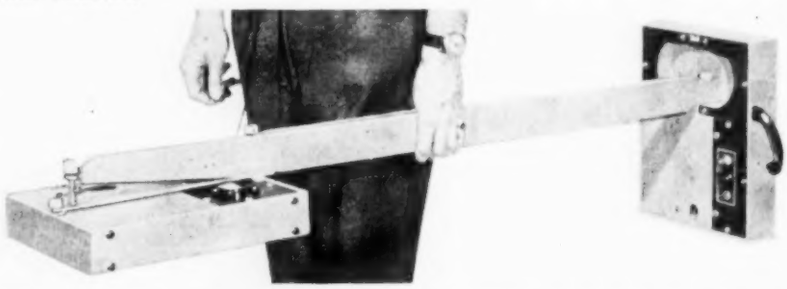
The Kendall Company, Polyken Sales Division

Miss. McClurkin was with Sun Pipe Line Company for 16 years in various phases of pipe line operations. His first assignment with Mid-Valley was as chief station engineer at the Longview station in 1951. He was promoted to station foreman at Oxford and also handled special operational assignments. Davis, formerly with Sohio Pipe Line Company, Standard Oil Company (Ohio), and Sohio Petroleum Company, joined Mid-Valley in 1950 as a station engineer at Clarkson, Ky. He moved to the Simpsonville pump station and transferred in 1954 to his present position as station engineer at Elkton pump station, Guthrie, Ky. Tumbleson, formerly with Sohio Pipe Line Company, joined Mid-Valley in 1950 as station engineer at Burlington, Ky. In 1951 he transferred to Mid-Valley's Longview pump station as station engineer.

The WILKINSON LINE LOCATOR

SEES WHERE YOU CAN'T

It will instantly locate all subsurface pipes, cables and such, and determine their depth too. The etched circuitry, our latest innovation, assures better quality control and performance than the customary hand wiring method. You can avoid damaged structures and loss of time with the Wilkinson Line Locator.



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Specify **"GOTKOOL"** the next time you order water cans or coolers. **"GOTKOOL'S"** exclusive construction keeps water cooler . . . fresher . . . purer. Extra wide, snug-fitting, splash-proof top keeps out impurities. Non-leaking, push-button faucets, either extended or recessed flush mounted. *Buy* **"GOTKOOL"** *at your supply store today.*

GOTKOOL Water Cooler — made in 2, 3, 5, 8, 10, 15, and 20-gallon sizes with extended or recessed flush-mounted faucet optional. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

GOTKOOL Water Can — made in 1½, 2, 3, 5, 10, and 20-gallon sizes without faucets. Extended or recessed flush-mounted faucets available at slight additional cost. *(Note: 15- and 20-gallon sizes available with extended faucet only.)*

Insist on the genuine — look for the *Blue and Black Label* with the name "GOTKOOL" in Red.

H. P. GOTT MFG. COMPANY

WINFIELD, KANSAS

John W. Morton has been promoted to assistant chief engineer for **Cities Service Gas Company.** For the past three years Morton has been engaged in general engineering duties and special projects in connection with pipe line and compressor station operation problems in the company's Oklahoma City office. Morton succeeds **John Gere,** who was promoted to chief engineer in 1953. Morton has been with Cities Service Gas Company since 1943. He was engineer in charge of construction of several of the company's compressor stations and was in charge of the Cities Service compressor plant, Pipe line division and shop at Caney, Kansas, for four years. Morton moved to the Oklahoma City office in 1954.

John W. Morton

•

R. C. Frederick, who was with **Gulf Oil Corporation** 28 years prior to joining Pacific Northwest Pipe Line Corporation in 1955, has rejoined Gulf in the Planning and Economics department. In his new position Frederick will be on the staff of P. H. Bohart, vice president, as planning coordinator for natural gas liquids, gasolines and liquefied petroleum gas. From November, 1955, until June, 1956, Frederick was vice president in charge of gas purchases and gas sales for Pacific Northwest with headquarters in Houston. After joining Gulf in 1927 as a clerk in the Executive department, Tulsa Production division, Frederick served as staff assistant to the vice president in charge of that office. He was transferred to the Pittsburgh general office in 1950 and appointed chief of the gas supply and disposition branch of the Production department staff. In 1953 he was named coordinator, gas and gas liquids for the Production department. He held that position when he left to join Pacific Northwest.

R. C. Frederick

Pipeliners like Gaso Pumps

P.L. G.P.

Pipe line engineers like Gaso Pumps because Gasos offer such complete assurance of every quality an engineer looks for in pumps. No doubts, worries or uncertainties when the specifications call for the pumps that are *first in their field!*

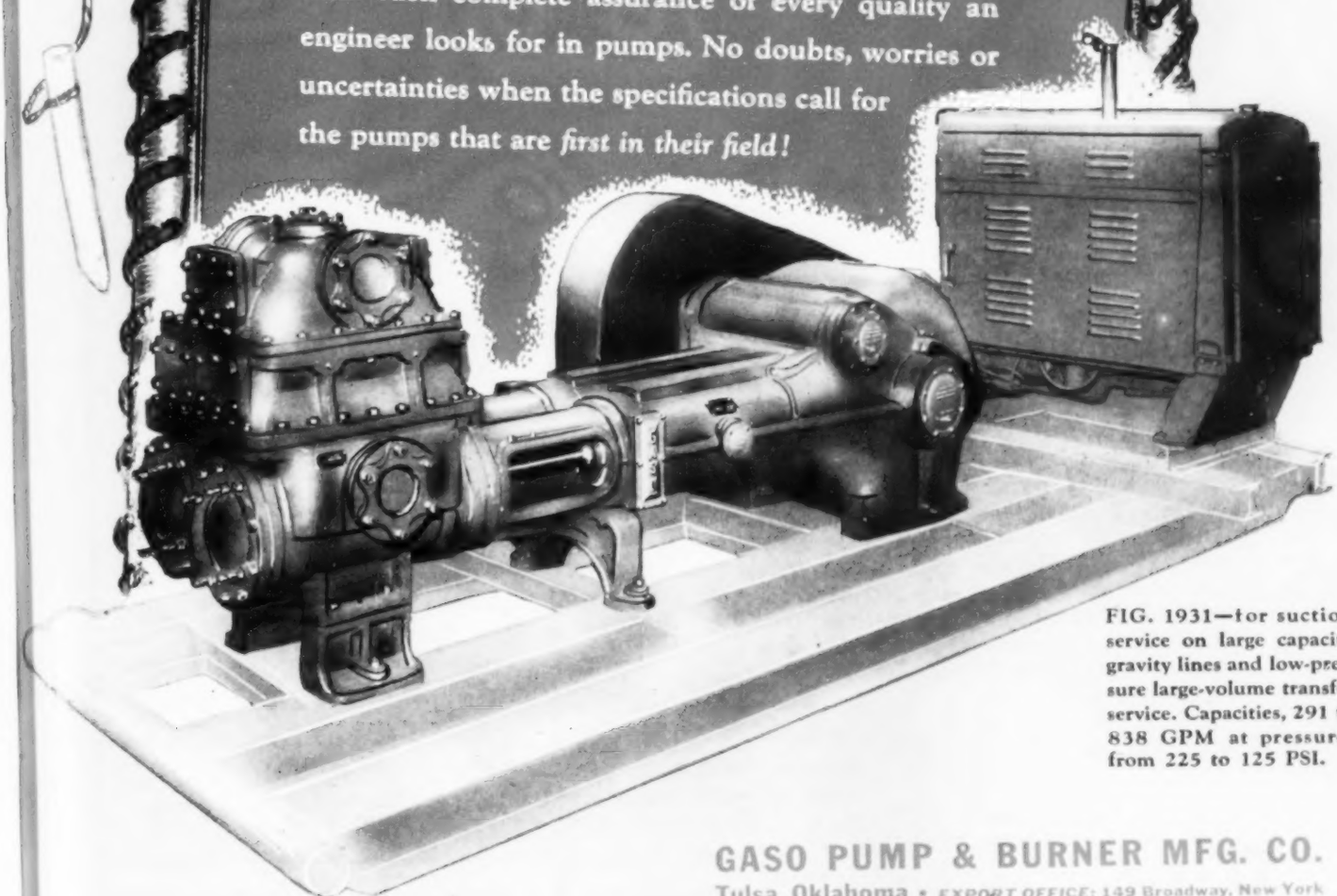

FIG. 1931—for suction service on large capacity gravity lines and low-pressure large-volume transfer service. Capacities, 291 to 838 GPM at pressures from 225 to 125 PSI.

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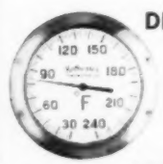
Good coffee—the kind that attracts knowing truckers to their favorite roadside stops—depends on careful preparation, *and* maintenance at *just the right temperature until serving*. That's why manufacturers of restaurant coffee makers have consistently used Rochester Bimetal Dial Thermometers for years. They know RMC thermometers assure customer satisfaction by giving long, trouble-free, dependable service.

By the same token, RMC Industrial Thermometers have been first choice with equipment manufacturers and processors in the food, dairy, petroleum, chemical and petrochemical industries. They appreciate their rugged stainless steel construction, hermetically sealed fog-proof dial chambers, and the exclusive RMC external dial-reset feature. They, too, know from experience that they can always depend on the lifetime accuracy of RMC instruments.

Look to RMC for Full-Line Instrumentation—for manufacturers and users of processing equipment—and many consumer products.

DIAL THERMOMETERS



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ROCHESTER MANUFACTURING CO., INC.
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Stuart F. Silloway has been named president of **Pacific Northwest Pipeline Corporation** of Houston and **C. R. Williams**, who has directed the operations of Pacific Northwest since 1951, has been appointed vice chairman of the board of directors. Silloway formerly was vice president for finance of The Mutual Life Insurance Company of New York and has participated in financing many oil and gas projects. As president, Silloway will be a director also of the pipe line company and its subsidiary, Northwest Production Corporation. He will make his headquarters in Salt Lake City, where the company is establishing its principal office.

Stuart F. Silloway

•

Panhandle Eastern Pipe Line Company has announced the promotion of **Garlin F. Crouch** to Central division pipe line superintendent. Crouch succeeds the late H. R. Graves. Crouch has been with Panhandle since 1939 and since 1952 he has served as district superintendent at Maumee, Ohio.

WHO'S MEETING WHERE

North Dakota Oil & Gas Association, Annual Meeting, Bismarck, N. D., August 20-21.

National Telemetering Conference, IRE, AIEE, IAS & ISA, Ambassador Hotel, Los Angeles, Calif., Aug. 20-21.

Sixteenth Annual Gas Measurement Short Course, West Virginia University, Morgantown, W. Va., Aug. 27-29.

Independent Natural Gas Association of America, St. Anthony Hotel, San Antonio, Sept. 9-12.

Pacific Coast Gas Association, Annual Meeting, Coronado, Calif., Sept. 11-13.

Mid West Gas Association Gas School and Conference, Iowa State College, Ames, Iowa, Sept. 12-14.

AIEE, Electrical Conference of Petroleum Industry, Muehlebach Hotel, Kansas City, Mo., Sept. 17-19.

ONE OF THE GARLOCK 2,000

Competitive Materials

Chart shows loss of thickness after alternating wet and dry exposure tests. Garlock 662 returns to within 1% of original thickness. No. 662, made from a cork paper base impregnated with a synthetic rubber, is dimensionally more stable than (A) beater process sheet with synthetic rubber binder, (B and C) sheets saturated with glue-glycerine binder.

GARLOCK 662 GASKET MATERIAL does not shrink or change shape

Here's convincing proof that gaskets of Garlock 662 can stand varying climatic conditions without drying, shrinking, or hardening. The gaskets illustrated were subjected to a 24 hour alternating wet and dry test for weeks, then conditioned at room temperature. As the photo and chart at right show, 662 gaskets returned to their original shape and to within 1% of their original thickness. Competitive types hardened, twisted, and shrank as much as 8%. No wonder so many companies are specifying 662 for use against gasoline, water, and oil at temperatures up to 300°F. It is approved by Underwriters' Laboratories, Inc. for use against hazardous liquids.

And longer-lasting 662 Gasket material is only one of "the Garlock 2,000" . . . two thousand styles of gaskets, packings, and seals to meet all your needs. It's the only complete line. It's one reason you get unbiased recommendations from your Garlock representative. Call him today or write for Bulletin AD-146.

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A FEW CCs CAN SAVE A LOT OF $$$

Chemical Pump set up to inject Kontol into finished product pipeline

Internal corrosion of pipelines results in the formation of corrosion products on the interior surfaces of the line. The presence of such corrosion products increases friction losses and decreases throughput. If pump pressures are increased to maintain throughput, pumping costs increase substantially. These corrosion products also contaminate and discolor refined hydrocarbon products. In addition, finely divided corrosion products are severely abrasive to machined parts of pumps, meters and the like.

Kontol Corrosion Inhibitors deliver hundreds of miles of protection for a few cents per mile. Protection generally is attained at a concentration of 2# of Kontol per 1000 barrels of hydrocarbon.

Kontol inhibitors are applicable to finished products lines, as well as crude transmission lines. By preventing corrosion, Kontol eliminates the many hazards caused by the products of corrosion. The lines are kept clean and free from fouling, eliminating the need for frequent scraping.

Kontol corrosion inhibitors are liquid organic semi-polar compounds, with solubility specifications to meet any need. Kontol adsorbs to the interior metal surfaces of pipeline equipment, forming an impenetrable film which prevents corrosion, scaling and fouling. Ask your Tretolite service engineer for complete information.

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American Society for Testing Materials, Pacific Coast meeting, Hotel Statler, Los Angeles, Calif., Sept. 16-22.

Instrument Society of America, Instrument Automation Conference and Exhibit, New York Coliseum, New York, Sept. 17-21.

Southeastern Gas Association, Hotel Sir Walter, Raleigh, N. C., Sept. 19-21.

Mid-Continent Oil & Gas Assoc., Louisiana-Arkansas Division, Annual Membership Meeting, Roosevelt Hotel, New Orleans, Sept. 20-21.

Products Control and Dispatching Group, 7th Annual Meeting, Lennox Hotel, St. Louis, Mo., Sept. 22-23.

American Society of Mechanical Engineers, Petroleum Mechanical Engineering Conference, Statler-Hilton, Dallas, Sept. 23-26.

API Executive Committee of the Board of Directors, Greenbrier Hotel, White Sulphur Springs, W. Va., Sept. 26.

International Gas Union, Sixth Annual Conference, Hotel New Yorker, New York City, Sept. 25-30.

American Institute of Electrical Engineers, Morrison Hotel, Chicago, Oct. 1-5.

Texas Mid-Continent Oil & Gas Association, Rice Hotel, Houston, Oct. 2-3.

Oil Progress Week, Oct. 14-20.

AGA Annual Meeting, Atlantic City, N. J., Oct. 15-17.

American Society of Civil Engineers, Pipe Line Division, William Penn Hotel, Pittsburgh, Oct. 15-19.

American Institute of Mining, Metallurgical and Petroleum Engineers, Petroleum Branch, Biltmore Hotel, Los Angeles, Oct. 15-17.

American Society of Civil Engineers, Annual Convention, William Penn Hotel, Pittsburgh, Oct. 15-19.

Rocky Mountain Oil & Gas Association, Annual Convention, Cosmopolitan Hotel, Denver, Oct. 22-24.

National Safety Council, Chicago, Oct. 22-26.

American Society of Safety Engineers, Annual Meeting, Conrad Hilton Hotel, Chicago, Oct. 23.

National Association of Corrosion Engineers, South Central Region, Gunter Hotel, San Antonio, Texas, Oct. 23-26.

Independent Petroleum Association of America, Annual Membership, Mayo Hotel, Tulsa, Oct. 25-26.

American Petroleum Institute, Annual Convention, Conrad Hilton Hotel, Chicago, Nov. 12-15.

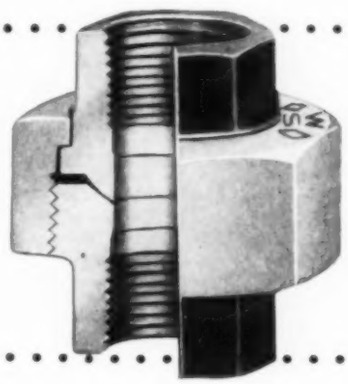
American Society of Mechanical Engineers, Statler Hotel, New York, Nov. 25-30.

Pipe Line Contractors Association, Ninth Annual Convention, Boca Raton Hotel and Club, Boca Raton, Fla., Jan. 14-16, 1957.

Petroleum Equipment Suppliers Association, Palm Springs, Calif., April 6-11, 1957.

W-S FORGED STEEL UNIONS...

These Features are YOUR GUARANTEE of a Safe, Tight Union Connection:



1. FORGED STEEL CONSTRUCTION— ASTM A-105, GRADE 2
2. SPHERICAL-TO-ANGLE MATING SURFACES
3. ANTI-GALLING, CADMIUM-PLATED NUTS

W-S Forged Steel Unions give you the kind of protection you need in high pressure piping systems. They're designed with precision-machined spherical-to-angle mating surfaces for positive seating, free from leaks even when pipes are slightly out of line. Cadmium-plated nuts resist galling and seizing and forged steel construction gives you the extra strength you need in high pressure service.

W-S Unions are available in 3000 lb. class, sizes ⅛" to 3" in screw-end and socket-welding types. Send today for your copy of Bulletin U-1.

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For more data on advertised products, use Readers' Service Cards, last page.

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Wherever personnel safety can be threatened by the lack of adequate protection from greases, oils, water, most acids and chemicals, that's where TOWER'S *extra protective* Clothing belongs. These comfortable, designed-to-fit garments are made of strong, impregnated fabric and are coated inside and out with hazard-resistant Neoprene Latex. Coats, jackets, overalls, hooded shirts, hats and aprons . . . for *every* industrial use. For complete information mail coupon today, or if you have a particular problem, let us know and we'll solve it quickly with the garment best suited to your needs.

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What's Happening

AMONG SERVICE AND SUPPLY MEN

Paul E. McDaniel

Don Sharp

Brazos Equipment Rental Buys Assets of Anderson Bros.

Brazos Equipment Rental Company of Houston has acquired the pipe line contracting assets of Anderson Bros. Corporation.

The pipe line construction equipment acquired by Brazos Equipment Rental Company is now located in Texas, Montana, Wyoming, Minnesota, Louisiana, Ohio and North Carolina. The equipment is now available to contractors on a rental basis or on a rental—purchase, outright sale or trade arrangement if desired. The equipment can be rented and moved to any job in the U. S., Canada or Mexico, according to Paul E. McDaniel, owner of the firm.

McDaniel is also president of Brazos Engineering Company, Inc.; Paul E. McDaniel, Inc.; and other companies. Don Sharp is general manager of the Brazos Equipment Rental. L. J. Knox is field representative, and M. D. Gier is shop superintendent. Sharp previously was sales manager for Brazos Engineering in charge of sales, distribution and application of heavy contractors' equipment for oil field, marine and industrial uses. Knox has been a superintendent for major pipe line contractors for the past 12 years. Gier, 25-year veteran in the pipe line industry, has had experience as superintendent of heavy equipment maintenance, construction and applications.

Machinery of most sizes and makes can be rented, from fill-in units to augment a contractor's equipment, up to complete spread equipment. More than 85 crawler tractors are available for various applications.

Koehring Subsidiary to Build C-R-C Ditching Machines

Koehring Company of Milwaukee and Crutcher-Rolfs-Cummings, Inc. of Houston have announced a combined venture to merge some of their activities dealing with the manufacture and sale of machinery used by cross country pipe line constructors in an effort to capitalize individual efforts at product diversification.

Koehring acquires the designs and manufacturing rights to the C-R-C Big Incher and Middle Incher cross country ditching machines which will be built at Newton, Iowa, by the Parsons Company, a Koehring subsidiary. C-R-C will sell the Big Incher, Middle Incher, Koehring excavators and Parsons Trenchliners to cross country pipeliners.

Power Machinery Appointed Agent for ALCO in 2 States

ALCO Products, Inc. and Power Machinery Company have announced the appointment of Power Machinery as exclusive manufacturer's agent in Oklahoma and Kansas for ALCO oil field equipment.

Last year Power Machinery was appointed by ALCO exclusive agent in Kansas, Oklahoma, Texas and Louisiana for the ALCOTWIN line of fin-tube heat exchangers. Under the new agreement Power Machinery will handle the complete line of ALCO oil field equipment built at the latter firm's Beaumont, Texas, plant, the former Beaumont Iron Works.

ALCO is engaged in a $1.5 million expansion program at its Beaumont plant. The construction includes a combination warehouse-office building with expansion of manufacturing facilities.

Gibson Elected Vice President Of South Chester Tube Company

South Chester Tube Company, Chester, Penn., announces the election of Francis H. Gibson as vice president—sales.

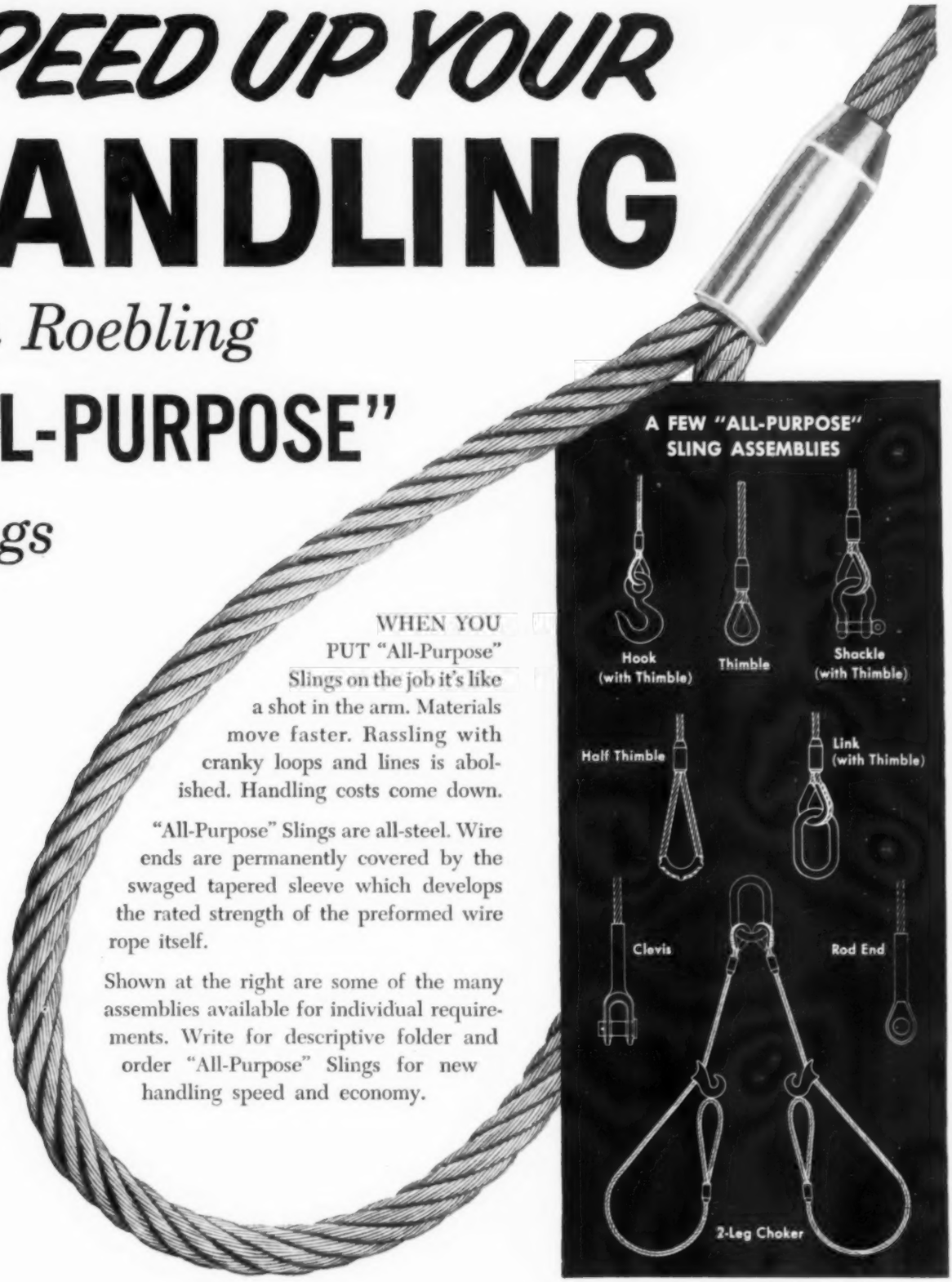
Gibson joined the South Chester Tube Company in 1927, following his graduation from Bucknell University. He served as a sales representative in Texas and West Virginia, then became district sales manager for the Pittsburgh area. In 1940, he was named general manager of sales.

NOTICE: Specify PELCO Welding Saddles

No change except the corporate name. We still have the same ownership, same management, same address, same telephone, and use the same 45 years of experience to render the same service under the same trade name—"PELCO."

PELICAN SUPPLY CO. INC.
P. O. Drawer 1108 Shreveport (84), La.
SEE YOUR NEAREST SUPPLY HOUSE

SPEED UP YOUR HANDLING with Roebling "ALL-PURPOSE" Slings



WHEN YOU PUT "All-Purpose" Slings on the job it's like a shot in the arm. Materials move faster. Rassling with cranky loops and lines is abolished. Handling costs come down.

"All-Purpose" Slings are all-steel. Wire ends are permanently covered by the swaged tapered sleeve which develops the rated strength of the preformed wire rope itself.

Shown at the right are some of the many assemblies available for individual requirements. Write for descriptive folder and order "All-Purpose" Slings for new handling speed and economy.

ROEBLING

Subsidiary of The Colorado Fuel and Iron Corporation

JOHN A. ROEBLING'S SONS CORPORATION, TRENTON 2, N. J. BRANCHES: ATLANTA, 934 AVON AVE. • BOSTON, 51 SLEEPER ST. • CHICAGO, 5525 W. ROOSEVELT RD. • CINCINNATI, 2340 GLENDALE-MILFORD RD., EVENDALE • CLEVELAND, 13225 LAKEWOOD HEIGHTS BLVD. • DENVER, 4601 JACKSON ST. • DETROIT, 915 FISHER BLDG. • HOUSTON, 6216 NAVIGATION BLVD. • LOS ANGELES, 5340 E. HARBOR ST. • NEW YORK, 19 RECTOR ST. ODESSA, TEXAS, 1920 E. 2ND ST. • PHILADELPHIA, 230 VINE ST. • PITTSBURGH, 1723 HENRY W. OLIVER BLDG. • SAN FRANCISCO, 1740 17TH ST. SEATTLE, 900 1ST AVE. S. • TULSA, 321 N. CHEYENNE ST. • EXPORT SALES OFFICE, 19 RECTOR ST., NEW YORK 6, N. Y.

It's time to compare . . . with LINK-BELT SPEEDER

True power hydraulic controls and greater usable horsepower make these LS-88 machines the

"diggingest" hoes on the spread!

ON River Construction Corp.'s spread near Jackson, Texas, everyone agrees their 9th and 10th Link-Belt Speeders (two LS-88 hoes) move out more rock and caliche than any other ¾-yd. hoes they've seen.

Delivering 88 usable horsepower, these LS-88's really sock the bucket into the trench—fill it fast, first pass. Fast, positive and easy-to-operate power hydraulic controls, plus greater usable horsepower, do the trick.

More powerful than similarly powered rigs

Like all Link-Belt Speeders, the LS-88 takes full advantage of all the power its engine was designed to produce—in some cases up to 30% more than the same make and model engine develops when used in other shovel-cranes.

That's because the LS-88 is built with added strength so it can easily handle extra horsepower. Uppers, lowers and booms are all-welded, stress-relieved. Big, hydraulic-actuated clutches are designed for heavy duty. Shafts are extra large, precision-turned from premium quality steel alloys and gears are machine-cut and hardened. Thus, with no increase in maintenance and service costs, the engine is set to run at the high speed for which it was designed—speed that develops peak output horsepower. The pay-off is at the bucket teeth—in more production in bigger profits!

SPREAD "SUPER" T. M. TATOM says, "We have had better luck getting rock out with Link-Belt Speeder than any other similar machines."

DITCH FOREMAN "TEX" MERIDA (left) reports, "They dig good in either mud or rock and walk fast on the road." OPERATOR BOB CLAUNCH, JR. (right), adds, "The LS-88 is simple to operate and is the diggingest rig I ever sat on!"

Link-Belt Speeder invites comparison

Why not arrange with your distributor to see a Link-Belt Speeder at work? You'll see why job report after job report shows Link-Belt Speeder shovel-cranes increasing output by up to 25% or more! LINK-BELT SPEEDER CORPORATION, CEDAR RAPIDS, IOWA. 14,211

LINK-BELT SPEEDER

Builders of a complete line of shovel-cranes . . . with exclusive Speed-o-Matic power hydraulic controls

J. K. Guinn

G. A. Whiteker

Jones & Laughlin Supply Announces . a -- Promotions

Jones & Laughlin Supply Division has announced two promotions in the district sales operations. J. K. Guinn, formerly general salesman at Oklahoma City, has been named district sales manager of the Central and Southern Oklahoma district with offices in Oklahoma City. He succeeds L. R. Roberts of Wewoka, Okla., who retired after almost 28 years of service with Jones & Laughlin.

In the West Texas district Glen A. Whiteker has been appointed assistant district sales manager to supervise the western section of the district out of Odessa, Texas; and H. H. Ray, assistant district sales manager based in Abilene, Texas, has been assigned specifically in charge of the eastern section. F. L. McFarland, Midland, Texas, is district sales manager of the West Texas district.

Guinn joined the firm in 1920 in Quay, Okla. After serving in various store and sales capacities, he was made district sales manager of the Michigan district in 1944. Ten years later when the Michigan district was integrated with the present Illinois-Kentucky district, Guinn returned to Oklahoma as a general salesman based in Oklahoma City. Whiteker started as a storeman in the Tulsa warehouse in 1945 and later became store manager at Best, Texas. He transferred to Wyoming, serving as manager of the Casper store until his resignation in 1947. Whiteker returned to Jones & Laughlin in 1951, was assigned to Hobbs, New Mexico, as a salesman and served in this capacity until his recent appointment.

Matner Joins Fischer & Porter As Chief Product Engineer

Vincent Matner has joined Fischer & Porter Company, Hatboro, Penn., as chief product engineer. He will be responsible for production design of all the company's mechanical and electro-mechanical products and components.

Matner was formerly a development engineer with Taylor Instrument Company and, more recently, chief product engineer at The Perkin-Elmer Corporation.

Kamrath Named Vice President Of Russell Engineering Corporation

Robert K. (Bob) Kamrath has been named vice president of Russell Engineering Corporation.

Formerly supervisor of buildings for The University of Texas, M. D. Anderson Hospital, and Tumor Institute in Houston, Kamrath also has worked for the Federal Bank of Houston, Wohlfield Construction Company and W. E. Callahan Construction Company.

Obbard and Paddock Receive U. S. Steel Division Posts

Norman B. Obbard has been appointed an assistant executive vice president—operations of United States Steel Corporation and Austin J. Paddock will succeed him as president of the corporation's American Bridge division.

Obbard began work with Truscon Steel Company as a draftsman in 1924 and two years later joined American Bridge as an engineer in the Tower department. He became assistant to vice president—sales in 1940. Two years later he was assigned to manage the shipyard division of the Ambridge, Penn. plant. He returned to the Pittsburgh office as assistant to vice president and in 1946 became vice president and general contracting manager. Obbard has been president of American Bridge since 1954.

Paddock joined American Bridge in the Erecting department. Later he was in the Drafting department, served as plant rate clerk and industrial engineer, and then as assistant to the manager of the company's Elmira plant. He served as manager of two plants and was appointed vice president—manufacturing in 1946, then promoted to vice president—contracting.

Atlas Powder Company Appoints Wetzel Manager of District Sales

Atlas Powder company has announced the appointment of James L. Wetzel as manager of its Eastern district explosives sales office, with headquarters in the company's general offices in Wilmington, Del.

Wetzel, manager of Atlas' explosives sales office in Pittsburgh since 1951, will be succeeded in that post by John K. O'Hare, special representative in the office.

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WILLIAMS BROTHERS
ENGINEERS and CONSTRUCTORS
OIL • GAS • WATER
PRODUCTS PIPELINES
PUMPING STATIONS
RECENTLY COMPLETED
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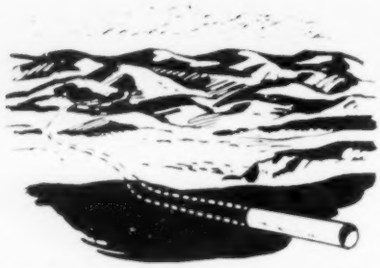
For more data on advertised products, use Readers' Service Cards, last page.



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Experienced "CORECO" engineers, specialists in design and installation of rectifier and galvanic anode cathodic protection systems, are ready to analyze and solve your corrosion problems.

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FOR COMPLETE CATHODIC PROTECTION

A Complete Design and Installation Service. Call, wire or write today to

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REPAIR LEAKS

QUICKLY—PERMANENTLY

SKINNER-SEAL PIPE JOINT CLAMPS stop leaks at joints. Put on under pressure—without interruption of service. Quick, simple, lasting repair. Sizes 1/2" to 24" incl. in stock.

SKINNER-SEAL COLLAR LEAK CLAMP—designed to stop every type of collar leak in oil and gas lines. Sizes: 2" to 13" inclusive.

M. B. SKINNER COMPANY

SOUTH BEND 21, INDIANA, U. S. A.

Curley Named Sales Engineer For Royston Laboratories

William R. Curley has been appointed sales engineer for Royston Laboratories, Inc. with headquarters at Monroe, La. He will represent Royston Laboratories in Louisiana, Mississippi, Arkansas, Missouri and West Tennessee.

W. R. Curley

Formerly Curley was associated with Interstate Natural Gas Company, the Hope Natural Gas Company, and Stuart Steel Protection Corporation. He has served as an engineer in the design, construction and operation of all phases of the natural gas industry, having worked in Production, Transmission, Distribution, Compressor Station, Gasoline and Hydrocarbon and Corrosion Engineering departments.

Arnold Retires as Vice President Of Garlock Packing Company

Phil Arnold, vice president of The Garlock Packing Company, Palmyra, N. Y. has retired as an official of that company after serving Garlock in a succession of sales capacities for 48 years.

Phil Arnold

Starting in 1908 as a Garlock sales representative in a midwestern territory, Arnold was later made railroad sales manager, then Cleveland district sales manager and in 1929 vice president in charge of sales. Early in 1950 he relinquished active direction of the company's sales activities, although remaining as a vice president in a partially active capacity.

Gupton Named District Manager For ALCO Products in Houston

Theodore Gupton has been named district manager at Houston for ALCO Products Inc. Gupton has been manager of the company's Kansas City district since 1934.

Gupton started his career with Prairie Pipe Line Company at Augusta, Kansas, and except for time in service and school, he continued with Prairie from 1916 to 1926. Gupton joined the McIntosh and Seymour Corporation, an ALCO predecessor, at Auburn, N. Y., and served as district sales manager in Tulsa and manager in Kansas City.

Manwaring to Direct Engineering For International Harvester

International Harvester Company has named Howard S. Manwaring, assistant director of engineering since 1953, director of engineering.

In addition to his general administrative duties, Manwaring will engage in motor truck and construction equipment engineering activities under the direction of A. E. W. Johnson, vice president in charge of engineering.

Manwaring joined the Harvester organization in 1934 as an experimental engineer at the company's Fort Wayne motor truck plant. He became product and test engineer at Harvester's Tractor Works in 1935 and was appointed manager of engineering, foreign operations, in 1946, serving in that capacity until his appointment to the position of assistant director of engineering.

BrakeSol

ELIMINATES COSTLY PARAFFIN REMOVAL METHODS

HOLDS PARAFFIN IN SUSPENSION from FORMATION to REFINERY

BRAKESOL is economical and safe to use, prevents and removes paraffin from the tubing, flow lines, tank bottoms and pipe lines. Effective on both asphalt and mixed-base paraffin.

FOR SERVICE CONTACT YOUR NEAREST BRAKESOL SALES ENGINEER

—EXPORT DISTRIBUTOR— The National Supply Co Export Division

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BRAKESOL, Inc.

P.O. Box 9506 Okla. City, Okla.

GUNITE COATINGS for PIPE LINES

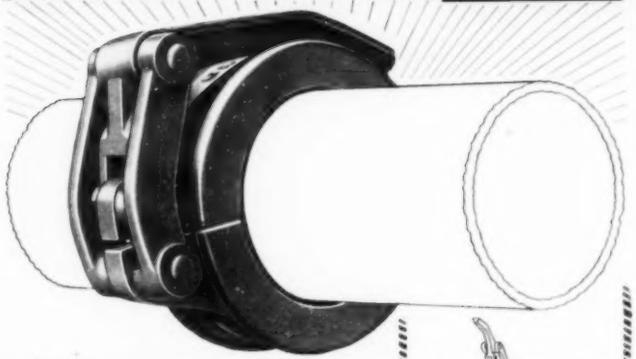
Reinforced GUNITE COATING being applied to pipe.

Your inquiry solicited.

GUNITE CONCRETE & CONST. CO.

1301 WOODSWETHER RD., KANSAS CITY 5, MO.
3206 HOUSTON, HOUSTON 9, TEX.
CHICAGO – ST. LOUIS – DENVER
MILWAUKEE & TWIN CITIES – NEW ORLEANS

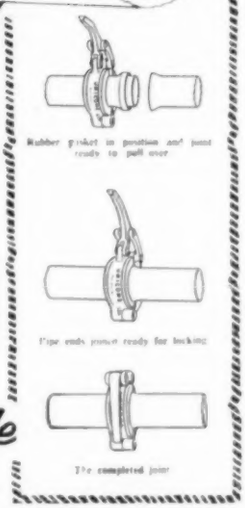
INSTANTANEOUS! JOINTS



A perfect seal in a matter of seconds

For temporary pipe lines 'Unicone' instantaneous joints are recommended. Comprising two parts only, they fasten with a "snap" ensuring a perfect seal in a matter of seconds.

For permanent or semi-permanent pipe lines 'Unicone' bolted type joints are usually employed and can be assembled far more quickly than any flexible joint giving positive anchorage.



'UNICONE' REGD

Flexible Joints for all Pipelines.

leakproof. safe. reliable

THE UNICONE COMPANY LTD.
RUTHERGLEN • GLASGOW • SCOTLAND

The ALSTON Pipe Cutter

is SAFER

saves TIME

and MONEY*

**Say hundreds of pipeline workers using the Alston Ratchet Pipe Cutter.*

safer

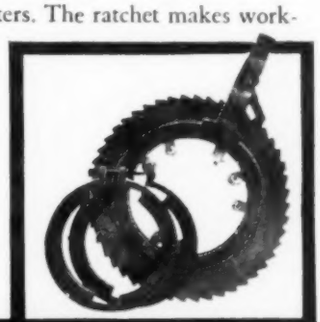
The Alston Pipe Cutter completely eliminates sparks . . . no line explosions. No more time consuming pipe bleeding.

quicker

This tool cuts 10-inch pipe in less than 15 minutes. Roller guides eliminate broken cutters. The ratchet makes working in close places easy.

saves money

Begin to use this precision made cutter in your pipeline operation for safer, quicker, economical pipe cutting. Write for literature and prices.

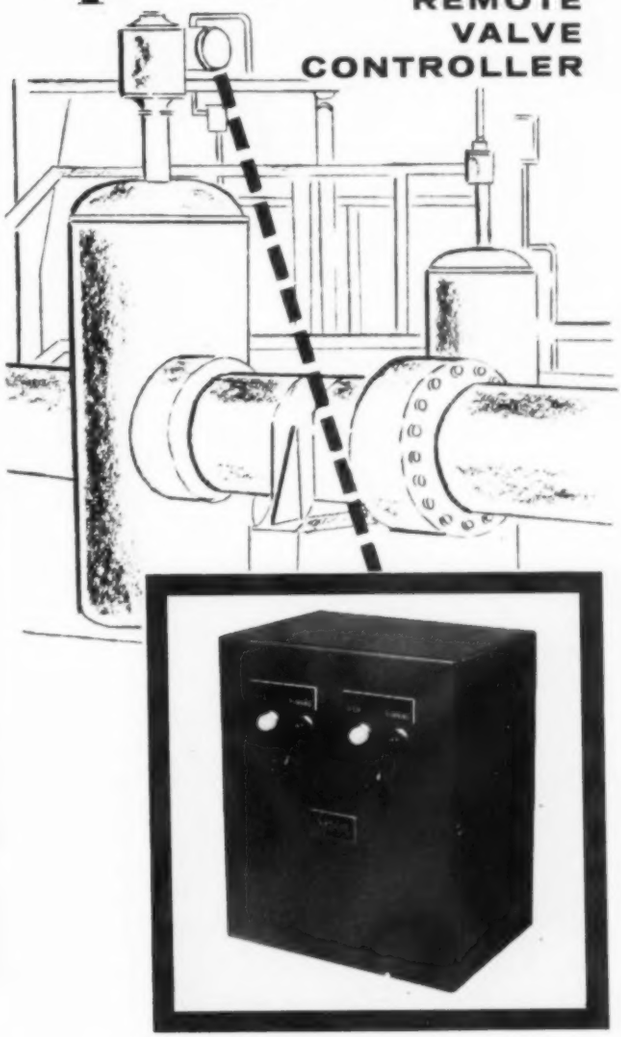


ALSTON Manufacturing Co.

Livingston, Texas
P. O. Box 707 Ph. 226

Sparton

REMOTE VALVE CONTROLLER



For Finger-tip Control Over Many Miles

Utilizes either a two conductor or single conductor and ground interconnection for long distance control. Employs DC impulses for remote open-close or proportional control of practically any valve.

Basic system provides valve status lamps on master control unit. Plug-in modules are easily added to provide additional supervisory lamps such as power failure; disagreement, control line failure.

Proven by use in many major pipe lines.

FULL STORY IN NEW BROCHURE

SPARTON CONTROL SYSTEMS DIVISION
The Sparks-Withington Company
Jackson, Michigan
Please send brochure
Name_____
Title_____
Company_____
Street_____
City_____ State_____

SAND-BANUM
BLUE SEAL EMULSION

REMOVE AND PREVENT SCALE AND CORROSION

from
Circulating Water Cooling Systems
in ALL Types of
Internal Combustion Engines
with
BLUE SEAL EMULSION

SAND-BANUM

Guaranteed Harmless to Equipment & Personnel

Get proper circulation of water and efficient heat transfer.

Increase lubricating efficiency.

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Stocked by Leading Supply Houses
Gulf Coast District Representatives
WESTERN SAND-BANUM CO.
1717 Chenevert Street, Houston, Texas

AMERICAN SAND-BANUM CO.
ESTABLISHED 1926
MEADOW BROOK NATIONAL BANK BUILDING
FREEPORT, NEW YORK

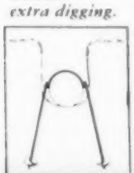
Here's the Fast Easy Way to Anchor Pipelines

No heavy equipment to haul. Cuts costs to a fraction.

Chance Pipe Line Screw Anchors and Brackets greatly simplify pipe line anchoring, compared to other methods, and save many dollars in pipe line construction.

Chance Pipe Line Screw Anchors can be installed in pipe line ditches without extra digging. Using a power wrench the operator merely guides the anchor in place. The tool does the work.

Can be installed in the ditch without extra digging.



Write for catalog showing oil industry applications of Chance Earth Anchors.

A·B·CHANCE CO·
CENTRALIA, MISSOURI
TORONTO, ONTARIO, CANADA

John W. Snider

Ralph Cordell

Crutcher-Rolfs-Cummings Announces Staff Additions

Three additions to the export, sales and service staffs of Crutcher-Rolfs-Cummings, Inc. have been announced. Ralph Cordell is now associated with the company as Export and Eastern division representative. Marvin Dewoody has returned to Crutcher-Rolfs-Cummings, Inc., after an absence of several years and John W. Snider recently joined the organization as Midwestern division representative.

Marvin Dewoody

Cordell formerly was associated with the National Pipeline Supply Corporation, Bechtel Corporation, Fish Engineers on the Transcontinental gas line, Trans-Arabian Pipe Line Company in Arabia, and Bechtel-Price and Callahan in Alaska and Canada.

Dewoody, who resides in Houston, formerly was associated with Pipeline Technologists, Inc. He is sales representative for the western part of the U. S. for both pipe line contractors and company sales.

Snider formerly was with the Cleaner Pipeline Company of Kansas City, Mo. and the Service Pipeline Company.

W-K-M Erects Display

A construction crew erects a 30-inch pipe line show valve to serve as a permanent display piece in front of the new plant of the W-K-M Manufacturing Company, Inc. at Missouri City, a few miles south of Houston. The valve is a standard weld-end 30-inch series 600 pipe line valve equipped with a special piston operator.

Kinney to Assist Vice President At Kaiser Steel Corporation

William H. Kinney has been appointed assistant to the vice president, Operations, for Kaiser Steel Corporation. His office will be in the Kaiser building, Oakland, Calif.

Kinney, who will render administrative assistance to George B. McMeans, vice president—operations, was previously resident metallurgical engineer for the company, engaged in customer contact work in northern California and the company's Sales and Metallurgical departments and operating divisions.

Stauffer Elected Vice President Of Mercoid Corporation

W. K. Stauffer, formerly manager in charge of the Philadelphia branch of The Mercoid Corporation, has been elected vice president in charge of the Eastern area.

See Composite and Refinery Catalogs, or Write for Specifications Folder

FLEET-LINE

PIPE SADDLES AND REDUCERS

Nozzle sizes from ¼" to 24"

ASTM A234

Also for pressure vessel heads

Nominal pipe sizes 1" to 30"

ASA B16.9
ASTM A234

Special sizes and lengths. Schedules 10 to 160 Stainless Steel, and other Alloys.

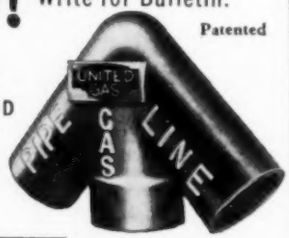
Immediate Delivery

STEEL FORGINGS, Inc.
P. O. Box 276K • Shreveport, La.
Foot of Fannin Street

NEW! Write for Bulletin.

Patented

PIPELINE VENTS AND MARKERS



FLEET-LINE CO.
P. O. BOX 276K
SHREVEPORT, LOUISIANA

Millions of American families cook with natural gas. And its precise, easily controlled heat makes it a superior fuel for industry

PLENTY FOR ALL...

The pitcher in the legend never ran dry. Natural gas is like that.

Each year, we use more than the last . . . yet end up with more than before. For gas discoveries continually exceed use.

The United States has vast reserves underground. Canada and Mexico as well. Still more gas has been found offshore under the waters of the Gulf of Mexico—the great potential.

As America needs more of nature's finest fuel, Tennessee Gas, the nation's longest pipeline, will deliver it.

TENNESSEE GAS
TRANSMISSION COMPANY
AMERICA'S LEADING TRANSPORTER OF NATURAL GAS
HOUSTON, TEXAS

One of a series of advertisements appearing in full color in national publications.

Building for the future...

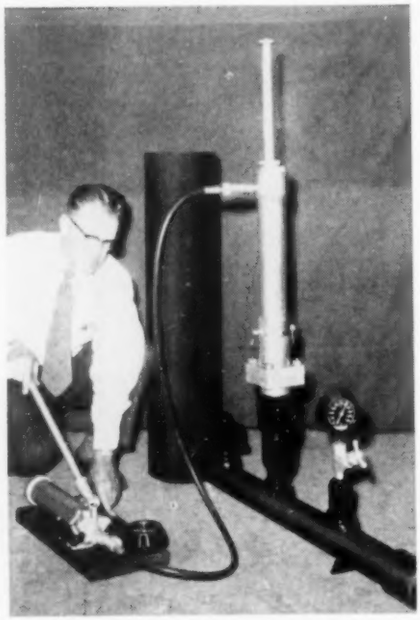
TGT advertisements like the above reassure millions as to the continuity and dependability of their natural gas supply.

That reassurance builds a solid backlog of confidence for the entire industry . . . enables producer, pipeliner and distributor to plan more efficiently for the future.

TENNESSEE GAS TRANSMISSION COMPANY
HOUSTON, TEXAS

What's New in Equipment

for the Pipe Line Industry



Hydraulic fluid is forced into cylinder by hand pump to move coupon holder down into high pressure line. A quarter turn of the shaft locks coupon in place, allowing removal of cylinder and pump for use at other test stations.

Corrosion Coupon Injector

Willis Oil Tool Company has announced a new tool designed for gathering corrosion data on equipment under continuous operation. The Willis corrosion coupon injector is a hydraulically actuated tool designed for the injection and withdrawal of metal samples in tanks, pipe lines, vessels and columns while under high pressure. For environmental studies in preventive maintenance, the sample injector is a compact device for subjecting the coupon to the system without shutting down or installing expensive bypass piping.

A removable piston carries the sample in or out of the high pressure line or vessel. Hydraulic fittings in the cylinder are used to drive or release the piston assembly which is removed or replaced through the quick opening end of the cylinder. A clapper valve holds high pressures while the piston assembly is removed and replaced. The cylinder and piston assembly may be removed by backing off and leaving the lower end of the piston assembly in a locked position. The cylinder is then free to be used at other sampling points. The base of the coupon injector is screwed into a standard, welded and drilled half coupling or tee.

(This item supplements Willis Oil Tool Company data on pages 5164-5167 of the Composite Catalog, 21st edition.)

For more data circle **No. E1** on Readers' Service Card, last page this issue.

Inertial Mass Flowmeter

A device which measures liquid or gas by weighing it continuously as it passes through a pipe has been developed by Inertial Instruments, Inc. The inertial mass flowmeter was developed primarily for use in jet aircraft fuel systems but is used also to solve special measurement problems in guided missiles, laboratory test equipment, pipe lines, petroleum refineries and other continuous-process industries.

The flowmeter, housed in a single sturdy assembly not much larger in diameter than the fuel line itself, weighs the fuel directly. The instrument is said to be accurate within plus or minus ½ of 1 percent, due to its method of operation and the elimination of temperature errors through the use of high nickel alloy for all elastic parts.

As liquid passes through the flowmeter, it is given a precise angular velocity by an impeller. Then a "measuring turbine" subdues this velocity completely. Since the original angular acceleration is constant and known, the torque necessary to subdue the liquid's velocity is a measure of the mass which was accelerated—the mass flow.

The torque of the measuring turbine activates a calibrated spring and the spring's deflection is converted into an electrical signal by an output transducer. The signal registers on a dial indicator, a digital counter, or a totalizer.

The flowmeter can handle liquids with specific gravities between .6 and 1.2 and viscosities of .2 to 24 centipoise, moving 0 to 15 pounds per second (overload rate: 100 pounds per second), at temperatures between —67 and 250° F.

Weighing only six pounds, it is immune to external moisture, sand, dust, dirt and fungi. All electrical components and circuits are hermetically sealed, so that it can be used to measure liquids which are explosion hazards. It is unaffected by shock up to 50 g, and vibration of 5 to 2000 cps up to 10 g—in any axis.

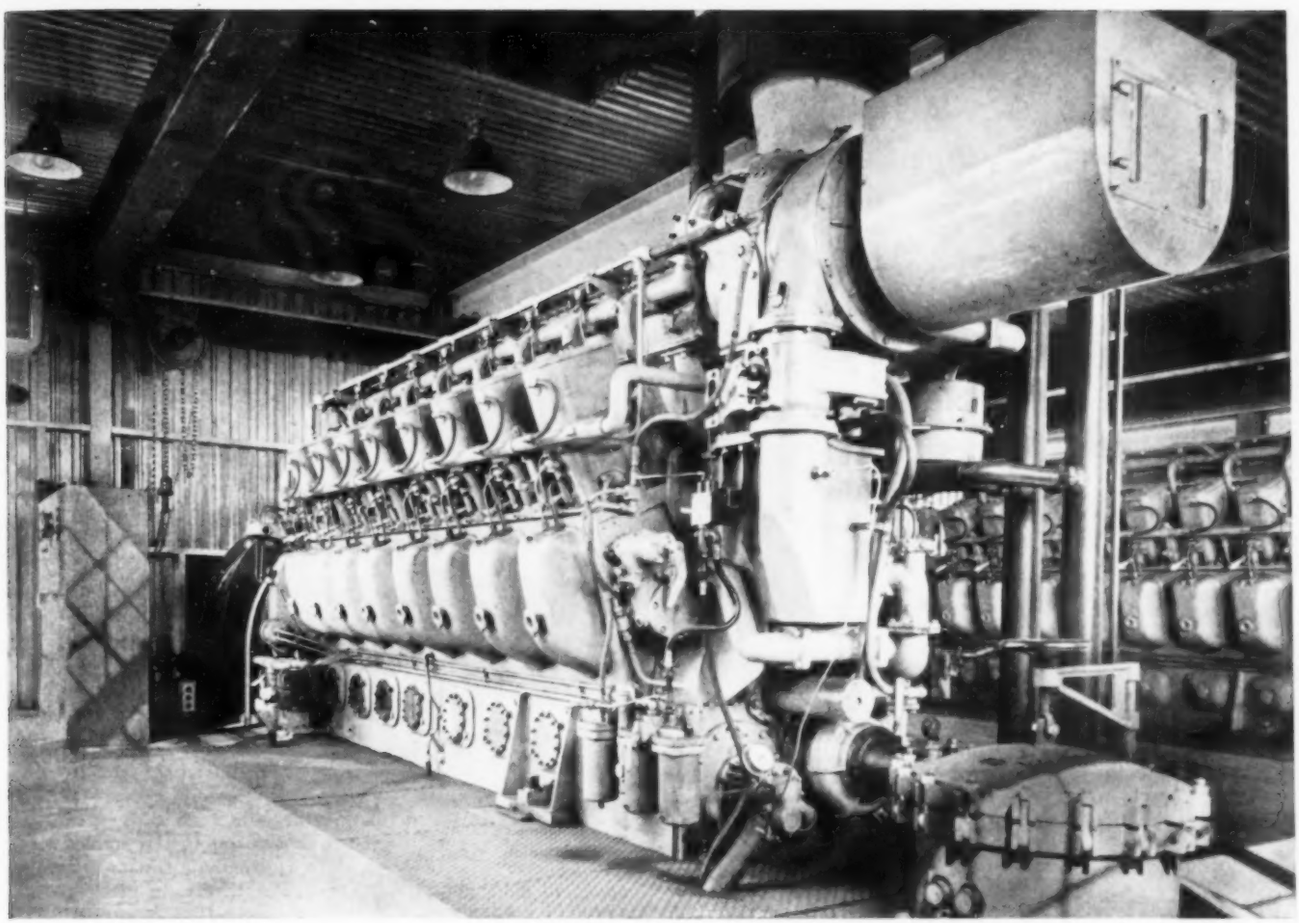
For more data circle **No. E2** on Readers' Service Card, last page this issue.

Parabolic Antenna

Prodelin Inc. has announced the availability of a new 28-foot parabolic antenna for tropospheric scatter transmission. Antenna feeds have been designed for use in the 450 to 2700 megacycle range. These new units are the only large tropospheric antennas on the market for which actual verified manufacturer's pattern and gain measurements are available. Quality control tests are made on these antennas with Prodelin's new scatter site turntable facilities.

Utilizing an aluminum mesh reflecting surface and back-up support, a 65-pound wind load rating is provided. The new Prodelin 28-foot parabolic antenna achieves stability through the use of tower "K" frame construction using all aluminum members. This antenna is shipped in 12 sections each of the reflecting surface and "K" frame members and enclosed in two shipping boxes.

For more data circle **No. E3** on Readers' Service Card, last page this issue.



One of two Alco *251 Vee 16 diesels recently installed for pumping at the Laton Station of the Service Pipe Line Company.*

ALCO 251 DIESEL SETS MODERN STANDARDS IN WEIGHT, POWER, ECONOMY

The Alco 251 diesel brings modern standards of light weight, high power, high efficiency and increased economy to all stationary and marine applications. Ranging in horsepower from 550 to 2400, the 3 modern turbo-supercharged 251 diesels – in-line six, Vee 12, and Vee 16 – all have interchangeable working parts. With a wide selection of standard modifications available, the engines are ideally suited to applications where the following advantages are desired:

Low Initial Cost – Standardized design, produced on assembly-line basis.

Low Installation Cost – Lower weight per horsepower, compact design, four-point mounting, and adaptability to "packaged" power applications.

Low Operating Cost–Strong, rugged weldments, modern metallurgy, adaptability to remote or automatic operation, and readily available, low-cost replacement parts.

Complete Service Facilities – Seven regional warehouses, three repair and rebuild centers, experienced field-service engineering.

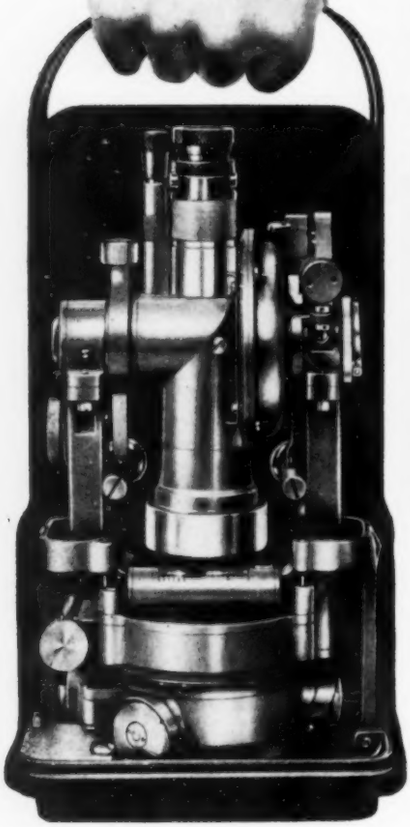
Contact your nearest Alco sales office or write P. O. Box 1065, Schenectady 1, New York for information.

ALCO

ALCO PRODUCTS, INC.
NEW YORK
Sales Offices in Principal Cities

For more data on advertised products, use Readers' Service Cards, last page.

ACCURACY IN YOUR HAND



Carry a Kern Instrument to assure a better, faster job. Kern's consistent research and experimentation result in functional, supremely accurate instruments for you; in-instruments for today and tomorrow.

KERN'S DKM 2
one second Theodolite f. Triangulation, big construction and Engineering Operation.

FAST DIRECT READING
To 1", Estimation to 1/10".
All reading from 1 position.

COMPACT INSTRUMENT
is highly portable. Weight 6 lbs. Height 7" including Metal Case.

Ask for detailed Brochure DK 518-8
SERVICE DEPARTMENT
FACTORY TRAINED PERSONNEL

Kern SWISS *The FINEST in SURVEYING EQUIPMENT*

KERN INSTRUMENTS INC.
120 Grand St., White Plains, N.Y.

Fire Fighting Unit

A new vehicle battery-powered fire fighting unit ready for instant use to combat small fires is available through McKinley Corporation. The new "Insta-Pumper" is a complete unit, including 90 gallon liquid tank, positive starting electric motor that runs off any vehicle battery, self-priming pump, pressure indicator, switches, battery cables, 50 feet of hose and spray nozzle.

The entire pumping unit is automatically and remotely controlled by regulating the hose nozzle. Normal output is seven gallons per minute at 20 feet water head, which is usually adequate to control small fires before they have had a chance to spread.

For more data circle **No. E4** on Readers' Service Card, last page this issue.

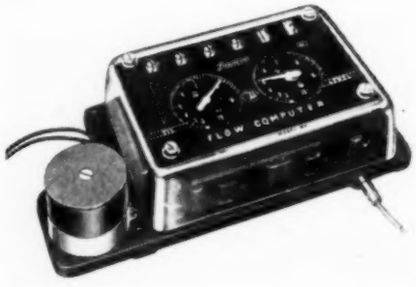
Flow Computer

Librascope, Inc. has announced the addition of the Librascope flow computer to its line of products. The Librascope flow computer is based on a new principle for continuously solving the flow equation of gases.

This computer will reduce and possibly replace need for charts in the orifice metering of gas. The device is mechanical, clock-meter driven (electrical, pneumatic or hand-wound) which may be installed in the instrument-case of an existing meter installation or obtained complete with pressure elements. The same type of pressure elements that actuate the pen arms will serve as inputs to the computer. Torque required for the computer is the same as for the pen arms.

The unit continuously computes the extension factor in the flow equation and totalizes the results on a mechanical counter, or provides a switch closure for an electrical pulse input. The totalizing is continuous over a differential or static pressure of 40:1 with an over-all accuracy of better than one percent.

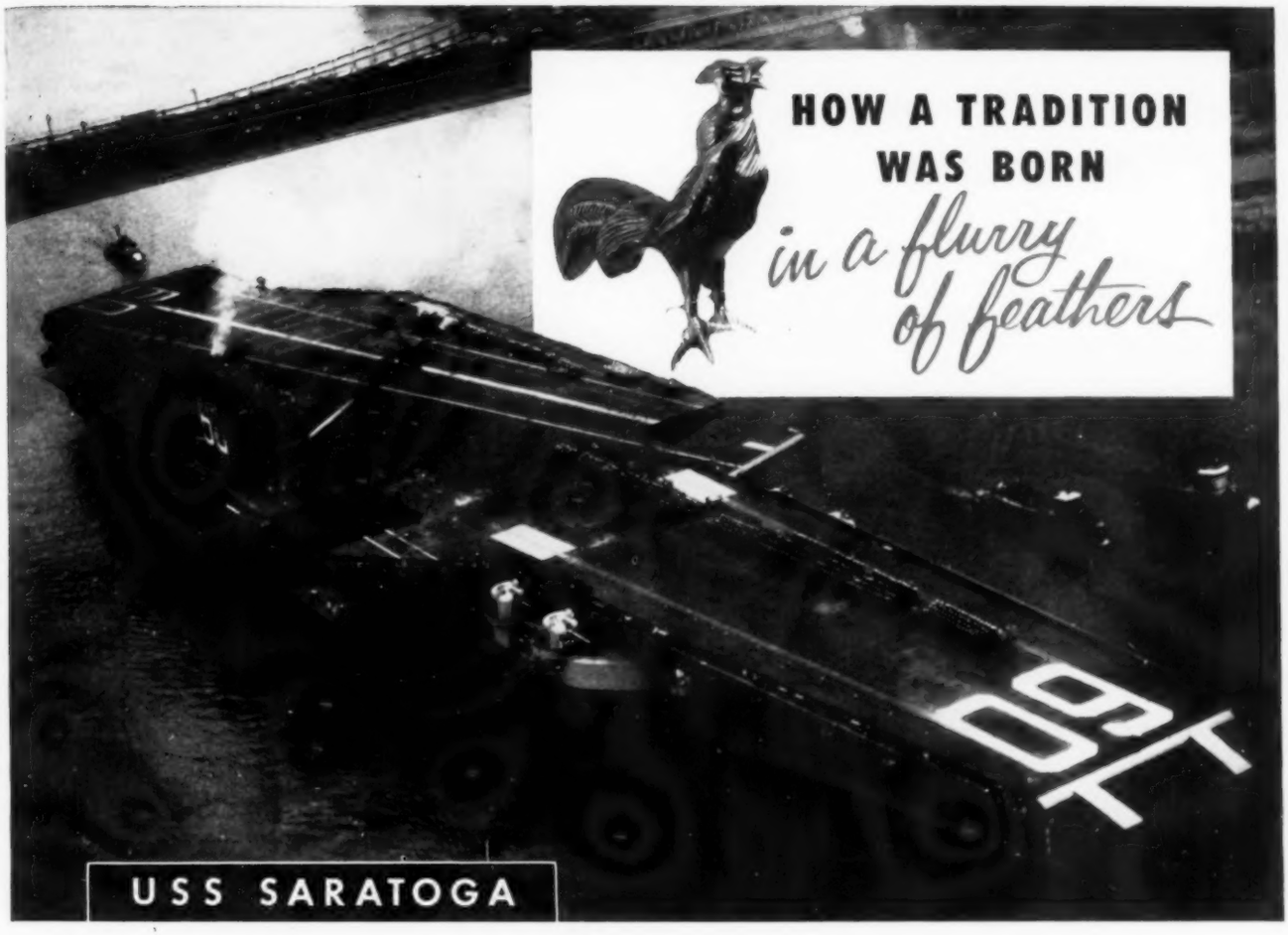
A standard electric clock motor will drive the counter at 30 revolutions per minute, which corresponds to 18,000 counts per hour. The mechanical circuit consists of a clock motor that drives a counter through a gear train and two double-disc integrators connected in series. The integrators, identical in design, consist of two hardened, ground and polished tool-steel discs. One disc transmits motion to the other through two steel balls held in a ball carriage. Through connecting linkage, the ball carriage moves from center a distance dependent on the motion of the pressure elements from zero. The magnitude of a speed change depends on the amount of displacement of the balls from the center of the disc.



The input valve is indicated on a dial calibrated in the same manner as a square root chart. The square root of the input value is generated by the combined action of the linkage and double discs.

Output is displayed on a counter, or may be transmitted by electrical impulses provided by a built-in switch.

For more data circle **No. E5** on Readers' Service Card, last page this issue.



The symbol, and the spirit, of the fighting gamecock lives on with the commissioning of the powerful aircraft carrier, *USS Saratoga*.

The incident which gave birth to this 142 year old Navy tradition took place on the decks of the first *Saratoga* as she closed for action against four men-o'-war in 1812. In the opening minutes of the engagement an enemy ball landed on deck – crashing into a coop containing a gamecock brought aboard by a sailor.

With a flurry of feathers, the startled bird flew to the rail and, as if expressing his personal indignation, crowed lustily and defiantly. Taking this as an omen of good luck, the outnumbered and outgunned American ship entered the battle with new courage and completely won the day.

The Navy's newest aircraft carrier is the fourth ship to bear the name *Saratoga* and adopt its fighting symbol. As aboard its sister aircraft carriers, the USS Forrestal, USS Independence*, and USS Ranger*, Walworth Valves and Fittings are installed. We are proud of the many contributions that our products and engineering skills have made to these outstanding vessels.

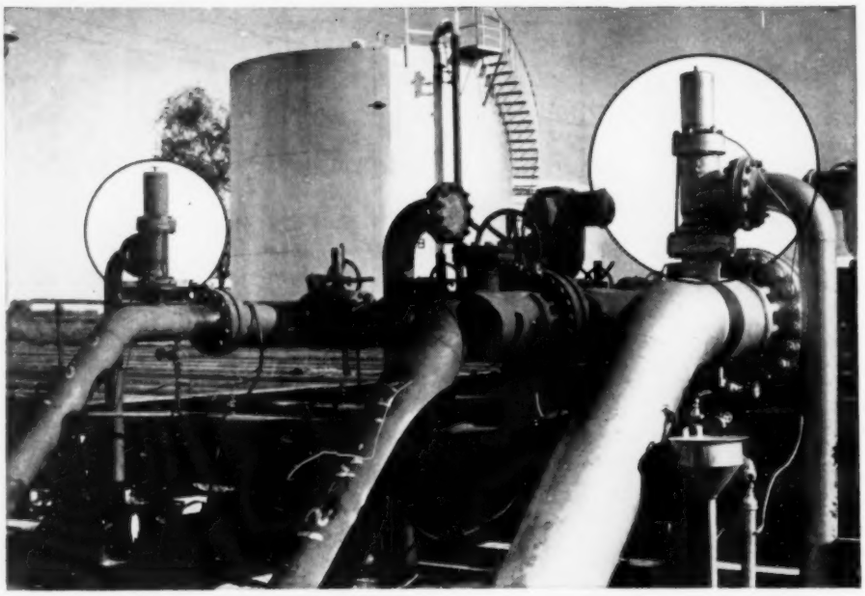
Walworth products installed aboard these ships include Pressure-Seal Cast Steel Gate, Globe, and Angle Valves, Fabricated Cast Steel Manifold Valves, Cast Steel Y-Globe and Angle Valves, Bronze Gate, Globe, Angle, and Check Valves and thousands of Walworth pipe fittings including Walseal* Fittings, Flanges, and Unions.

*Now under construction.

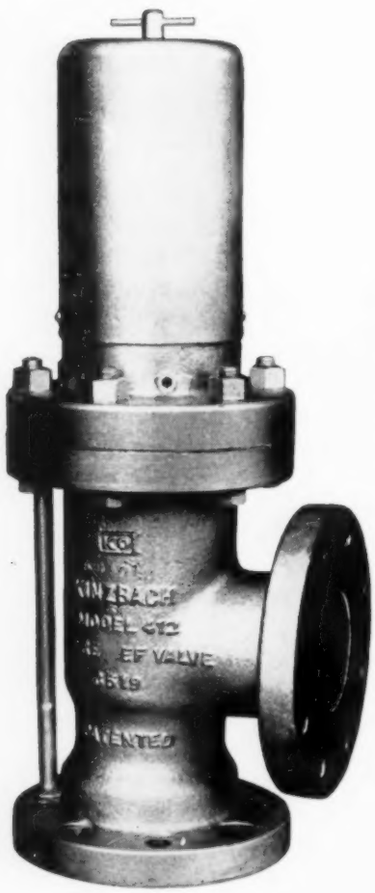
WALWORTH

60 East 42nd Street, New York 17, New York

SUBSIDIARIES: ALLOYED ALLOY STEEL PRODUCTS CO. CONOFLOW CORPORATION M&H M & H VALVE & FITTINGS CO. SW SOUTHWEST FABRICATING & WELDING CO., INC. WALWORTH COMPANY OF CANADA, LTD.



Positive Protection Against Pressure Surges



KINZBACH
MODEL 412
RELIEF VALVE
for Pipelines and Refineries

When a pressure overload in the line is reached, the Kinzbach Model 412 Relief Valve opens instantly to full capacity. This valve provides automatic resetting at a pre-determined pressure drop, positive seating and facilities for functional testing.

The Model 412 uses line pressure for opening and closing. The opening pressure is preset by application of a dead weight load. Opening and closing action is positive and reliable. The pre-set pressure never changes.

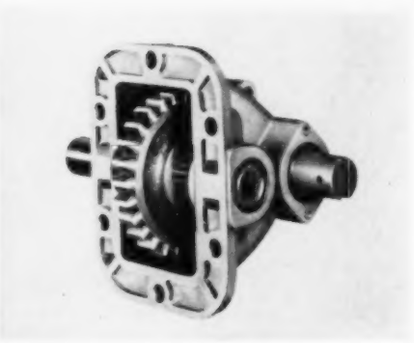
Kinzbach Model 412 Relief Valves are available in 2", 3", 4", 6" and 8" sizes for working pressures up to 1000 p.s.i. Write for Bulletin RV412 for full technical data.

KINZBACH TOOL CO INC

KINZBACH TOOL COMPANY, INC.

P. O. Box 277 Houston, Texas

Export Office: 74 Trinity Place, New York, N. Y.



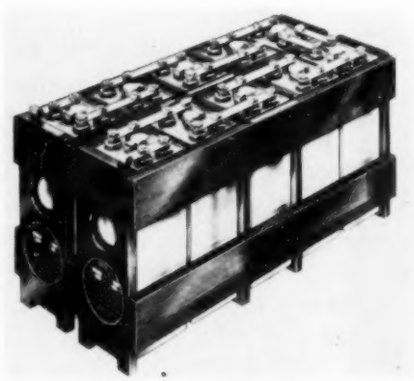
Truck Power Take-Offs

Tulsa Winch, Division of Vickers, Inc. has announced the addition of a new series to its line of truck power take-offs. This company's new single speed, single gear power take-offs for medium duty operation are designated Series 22.

Manufactured in nine different models to accommodate all popular transmissions, the series offers die-cast aluminum housings for extra lightness and strength; three optional output shaft sizes—shafts rotate on needle bearings; hardened shaved gears that mesh with transmission only while take-off is operating; heavy duty oil seals, and optional cable or lever control.

The Series 22 take-offs can be furnished in any one of four assemblies; assembly arrangement is indicated on every power take-off nameplate by letter and numeral code.

(This item supplements Tulsa Winch, Division of Vickers, Inc., pages 4944-4945 of the Composite Catalog, 21st Edition.) For more data circle **No. E6** on Readers' Service Card, last page this issue.



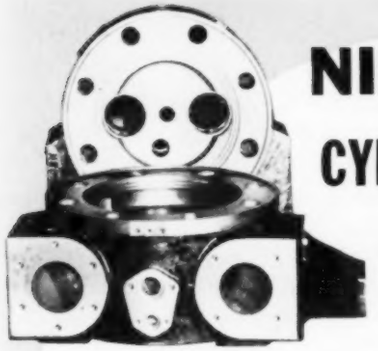
Storage Battery

Nickel Cadmium Battery Corporation's new high output nickel cadmium pocket plate storage battery is outstanding for diesel engine starting, standby power, switch tripping and closing and emergency lighting.

Featuring long life and durability under severe environmental conditions, the battery also has features of low cost maintenance and dependability, which are of particular value for remote or unattended locations.

The active materials, nickel and cadmium oxides, are locked in finely perforated steel pockets formed into plates. Cell containers are made of steel and the electrolyte is a solution of potassium hydroxide. No corrosive fumes are given off on either charge or discharge.

For more data circle **No. E7** on Readers' Service Card, last page this issue.



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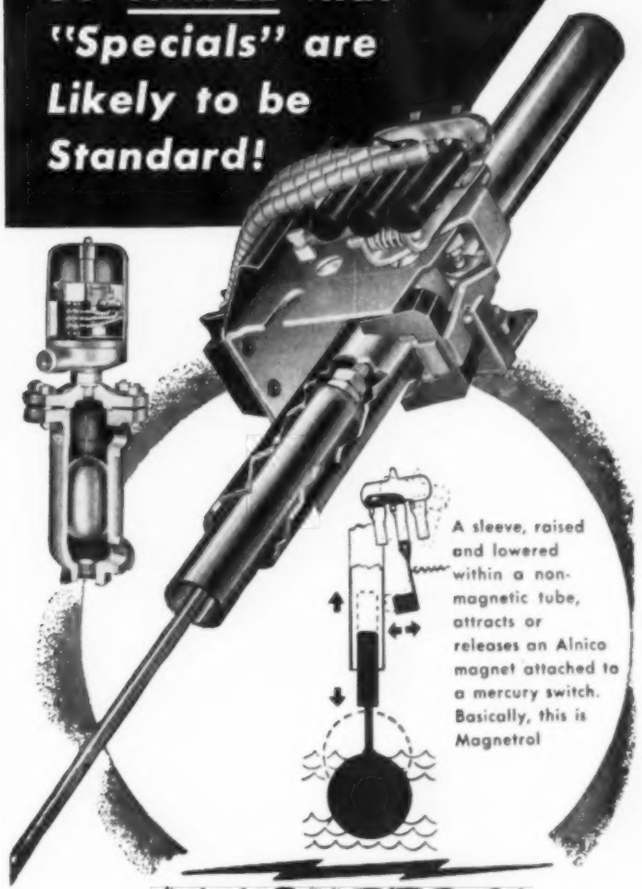
A sleeve, raised and lowered within a non-magnetic tube, attracts or releases an Alnico magnet attached to a mercury switch. Basically, this is Magnetrol

MAGNETROL

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LIQUID LEVEL CONTROL

Because of the utter simplicity of Magnetrol's magnetic operating principle, standard models can be easily adapted to meet any special requirements for pressure, temperature or corrosive liquids . . . and usually at little extra cost. This Magnetrol versatility has solved all kinds of tough level control problems . . . and given our engineers wide application experience that can be invaluable to you.

Magnetrol is so simple that failure is all but impossible! Using only permanent, unfailing magnetic force for its operation, there's nothing to wear out . . . no diaphragms or bellows to stiffen and rupture . . . no electrodes to short or corrode . . . no packing to bind or leak. Magnetrol is practically maintenance-free! Magnetrol units are available for controlling level changes from .0025-in. to 150-ft. . . . with multi-stage switching when desired. Send coupon for full details.

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Please send me catalog data and full information on Magnetrol Liquid Level Controls.

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Company_____

Address_____

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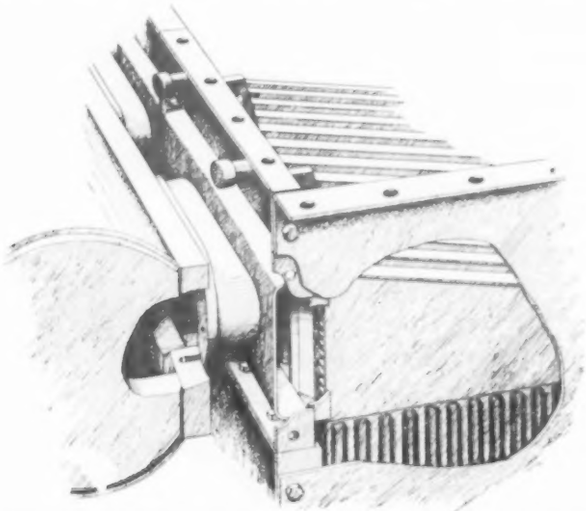
how

a

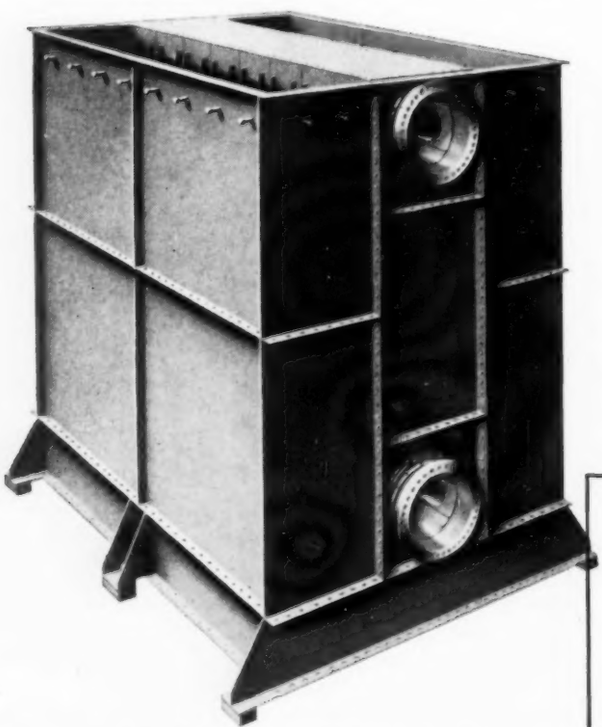
PIN-FIN

extended-surface regenerator



Detail sketch showing specially designed 'pin-like' shapes which greatly increase heat-transfer surface area.

adds to economy of gas-turbine operation . . .



Compact, light-weight PIN-FIN Regenerator unit.

REDUCED FUEL CONSUMPTION is a principal reason. For example, a 75%-effective Air Preheater PIN-FIN Regenerator in a gas-turbine cycle at 6 to 1 pressure ratio and a turbine inlet of 1500 F, will cut fuel consumption by about 32%.
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Mechanical Advantages of Air Preheater's PIN-FIN Regenerator...

- Compact
- Light-weight
- Quickly erected
- Minimum maintenance
- Convenient, one-unit design
- Easily disassembled

Air Preheater Corporation 60 East 42nd Street, New York 17, N. Y.

New Equipment Literature

For more data on New Equipment or copies of Catalogs and Literature reviewed in this issue, use the Reader Service postcards just inside the back cover and facing the Advertisers Index. Simply circle code numbers of items desired—sign and mail card.

Crawler Tractors

Mechanical features of the new International diesel crawler tractors are described in a new folder published by International Harvester Company. Described are the International TD-24, TD-18, TD-14, TD-9 and TD-6 models, with photographs of the machines on the job and close-ups of such features as the new Cerametallic clutch facings, improved operator visability, pressurized cooling system, etc.

To get a copy circle **No. E8** on Readers' Service Card, last page this issue.

Temperature Regulator

A. W. Cash Company has issued a bulletin with information on the Cash Standard Stacon Series V self-operating temperature regulator. The Series V regulator is recommended for steam, water, gases and all fluids not corrosive to brass and operates on a liquid filled thermostatic system, either direct or reverse acting. The bulletin contains such data as weights and dimensions, pressure and temperature ratings, accessories, construction and performance characteristics.

To get a copy circle **No. E9** on Readers' Service Card, last page this issue.

Vibration Monitors

A new bulletin released by The Beta Corporation describes its line of manually reset vibration monitors and malfunction detectors. Included is detailed information on how vibration monitors detect malfunctions in rotating equipment and how the devices are installed and adjusted.

To get a copy circle **No. E10** on Readers' Service Card, last page this issue.

Cutting Machines

A recent revision of the Beaver abrasive cut-off bulletin has been produced by Beaver Pipe Tools, Inc. The new bulletin features the various Beaver "Speed-Cut" abrasive cutting machines and gives specifications, descriptions, cutting times and other features. Among the models included in the bulletin are the standard floor model abrasive cutting machine, the bench or triped model, the wet cutting floor model, and the car trailer model.

To get a copy circle **No. E11** on Readers' Service Card, last page this issue.

Magnetic and Motorized Valves

The Mercoid Corporation has published a new catalog illustrating and listing specifications of magnetic and motorized valves for use with air, water, gas, steam, oil and refrigerants.

To get a copy circle **No. E12** on Readers' Service Card, last page this issue.

International Tractors

Information on the new International TD-6, TD-9, TD-14 and TD-18 diesel crawler tractors is contained in a new folder now available from International Harvester Company. The TD-6 features new engine power, stepped up 23 percent to 41.5 horsepower; a new hinge-type seat, permitting easy lubrication of steering clutch assemblies; improved visibility for the operator; a cerametallic clutch; pressurized cooling system, and improved, trouble-free lubrication system.

To get a copy circle **No. E13** on Readers' Service Card, last page this issue.

Motor Catalog

Marathon Electric Manufacturing Corporation has issued a 300 page catalog, a complete cross reference between old and new NEMA ratings both horsepower and dimensions. It covers current pricing for 1/20 through 1000 horsepower motor sizes on both fractional and integral horsepower motors. Other information includes adapter basis and prices from old to new NEMA frame mountings and popular standard motor modifications.

To get a copy circle **No. E14** on Readers' Service Card, last page this issue.

Pump Bulletin

Ingersoll-Rand has available a new bulletin covering the redesigned line of DMV-DHV single stage centrifugal pumps. Designed for general hydraulic services, these pumps have double mechanical shaft seals which eliminate stuffing box maintenance, and pre-lubricated, sealed ball bearings which require no lubrication throughout their life. Single mechanical seals are also provided for services where the liquid being handled is clean and supplied at a positive suction pressure. These horizontally split, single-stage pumps are built in sizes from 3 to 6 inches with heads to 350 feet and capacities from 250 to 2400 gallons per minute.

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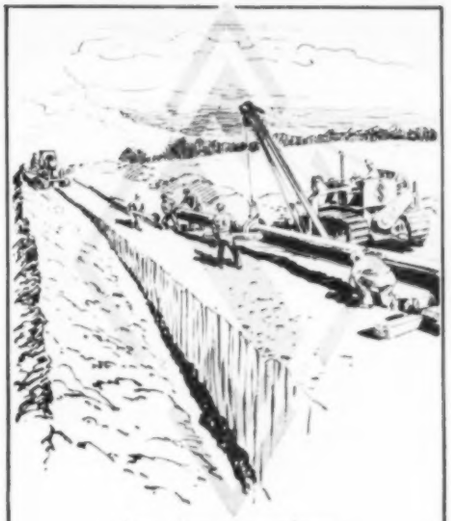

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operating bases assure our customers the best possible pipeline patrol . . . in regular service as well as during emergencies. It'll pay you to investigate the more efficient, less expensive pipeline patrol supplied by gleason romans.

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D7-7M Caterpillar dozier.

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22 White winch truck, 23 Tulsa winch, straight air.

1950 Chevrolet winch truck.

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95 Cleveland Ditching Machine

Good running condition. Cuts 24 x 5½.
$2500 – terms if needed.
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Coming in September . . .

Next month's issue will be devoted to maintenance of stations, construction equipment, and pipe line facilities.

Included in the editorial array of features will be articles written by industry leaders presenting good ideas to help you with:

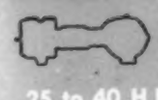
- Maintenance of contractor's machinery
- Inspection of pipe line and right-of-way
- Compressor station maintenance—An engineering report on trouble-shooting gas turbine compressors
- Keeping better maintenance records with check sheets

These and other valuable operating helps will make that issue well worth reading and saving.

frank wheatley

the most complete line of reciprocating power pumps for oil, salt water, mud, acid, and LPG

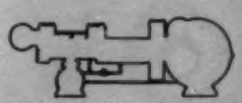
PUMPS



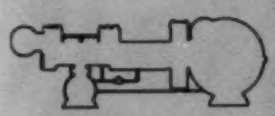
25 to 40 H.P.

50 to 75 H.P.

75 to 125 H.P.



150 to 200 H.P.



200 to 350 H.P.

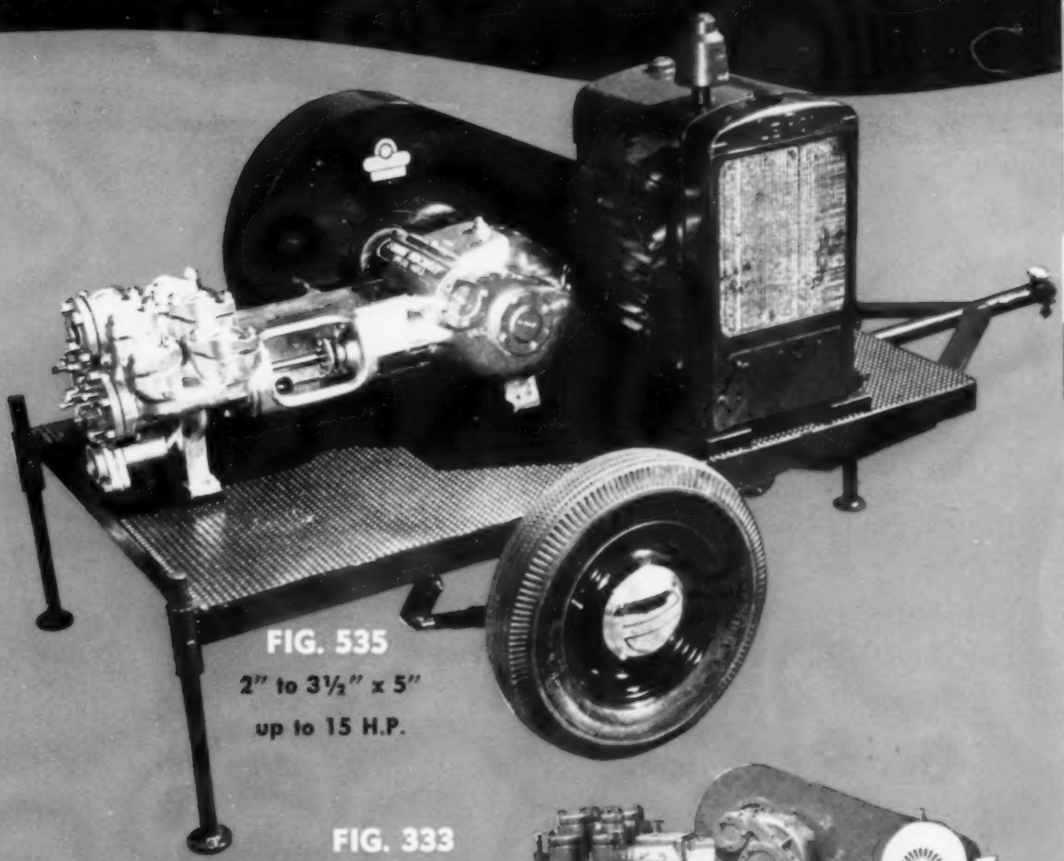


FIG. 535
2" to 3½" x 5"
up to 15 H.P.

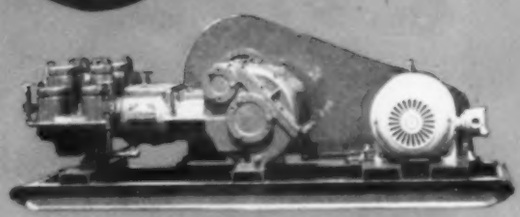


FIG. 333
1¾" to 3" x 3"
6 up to 10 H.P.

	LINER	STROKE	BPH	PSI	RPM	HP
FIG. 333	1¾	3	20	1000	125	9
	2	3	26	760	125	10
	2¼	3	34	600	125	10
	2½	3	43	490	125	10
	2¾	3	52	400	125	10
	3	3	63	340	125	10
FIG. 535	2	5	34	854	100	13
	2½	5	56	510	100	14
	3	5	83	350	100	14
	3½	5	114	260	100	14

Examine the physical appearance (above) and performance characteristics (below) of the Frank Wheatley #535 and #333 piston power pumps. They're the little units with the broad backs ready to handle your toughest assignments in small capacity, high pressure tank battery, field gathering, or salt water injection work. Popular? Just ask any of the 2000 present users! These are the "little giants" of the unequalled Frank Wheatley line . . . a line that has led the pump industry for over 40 years. More than 75 various units maintained in field-stock for immediate shipment.

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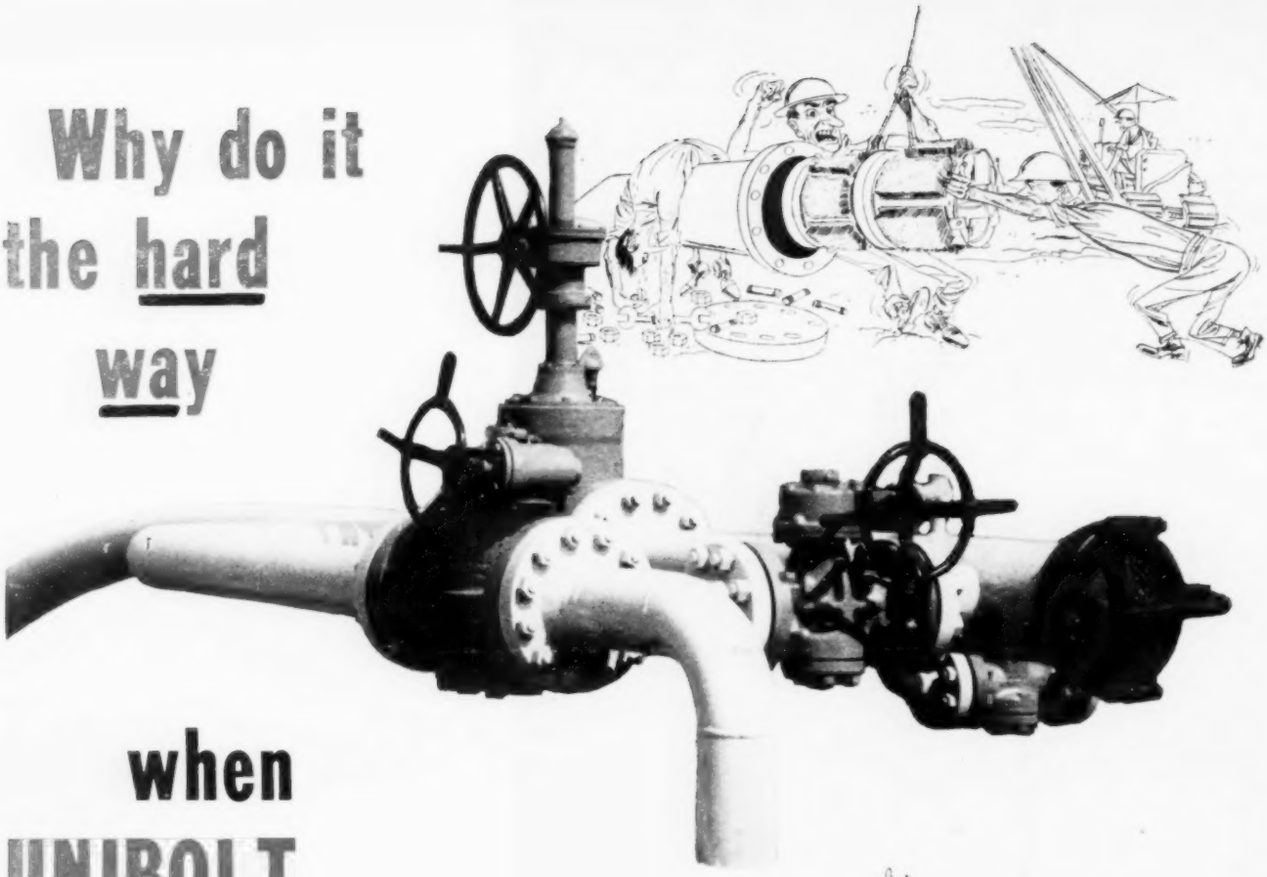
FRANK WHEATLEY
PUMPS & VALVES
TULSA 6, OKLAHOMA

EDMONTON

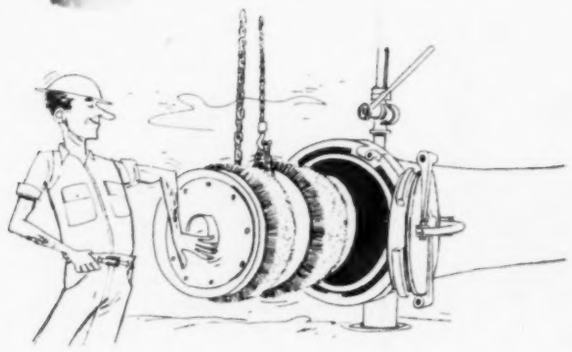
Why do it the hard way



when UNIBOLT Scraper Traps

(with oversize barrel)

make pigging so easy!



Unibolt Scraper Trap Closures are the most convenient, most practical means for blanking off a line so that pigs may be easily inserted and removed from the trap. The scraper barrel being slightly larger than the pipe itself, the pig is easily inserted or removed. It is no longer necessary to "fight" the pig in and out of the trap. Release two bolts and the blanking plug swings open on a sturdy hinge. Swing the trap shut, tighten the bolts, and that's all. Let the pumps do the hard work. No heavy blind flanges to lift on or off. No multiple bolts to release and make up. Nothing to fall on the workmen. No leaky threads. An oil-resistant gasket seals automatically . . . seldom needs replacing.

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